Applied Air

INSTALLATION, OPERATION AND MAINTENANCE MANUAL FOR INDIRECT GAS-FIRED HEATERS

ATTENTION: READ THIS MANUAL AND ALL LABELS ATTACHED TO THE UNIT CAREFULLY BEFORE ATTEMPTING TO INSTALL, OPERATE OR SERVICE THESE UNITS! CHECK UNIT DATA PLATE FOR TYPE OF GAS AND ELECTRICAL SPECIFICATIONS AND MAKE CERTAIN THAT THESE AGREE WITH THOSE AT POINT OF INSTALLATION. RECORD THE UNIT MODEL AND SERIAL No.(s) IN THE SPACE PROVIDED. RETAIN FOR FUTURE REFERENCE.

FOR YOUR SAFETY

The use and storage of gasoline or other flammable vapors and liquids in open containers in the vicinity of this appliance is hazardous.

POUR VOTRE SÉCURITÉ

L'utilisation et l'entreposage d'essence ou d'autres liquides ou produits émettant des vapeurs inflammables dans des récipients ouverts à proximité de cet appareil est dangereux.

ETL SINCE 1896

ETL C SINCE 1896

FOR YOUR SAFETY

If you smell gas:
1. Open Windows
2. Don't touch electrical switches.
3. Extinguish any open flame.
4. Immediately call your gas supplier.

POUR VOTRE SÉCURITÉ

Si vous sentez une odeur de gaz :
1. Ouvrez les fenêtres.
2. Ne pas actionner d'interrupteur.
3. Éteindre toute flamme ouverte.
4. Appelez immédiatement votre fournisseur de gaz.

WARNING: Improper installation, adjustment, alteration, service or maintenance can cause property damage, injury or death. Read the installation, operating and maintenance instructions thoroughly before installing or servicing this equipment.

AVERTISSEMENT : Une installation déficiente, de même qu'un mauvais réglage, modification, entretien ou maintenance peuvent occasionner des dommages matériels, corporels voire causer la mort. Lire attentivement les instructions d'installation, d'utilisation et d'entretien avant d'installer ou d'intervenir sur cet appareil.

WARNING

Install, operate and maintain unit in accordance with manufacturer's instructions to avoid exposure to fuel substances or substances from incomplete combustion which can cause death or serious illness. The state of California has determined that these substances may cause cancer, birth defects, or other reproductive harm.

INSTALLER'S RESPONSIBILITY

Installer Please Note: This equipment has been test fired and inspected. It has been shipped free from defects from our factory. However, during shipment and installation, problems such as loose wires, leaks or loose fasteners may occur. **It is the installer's responsibility to inspect and correct any problems that may be found.**

Applied Air 4830 Transport Drive, Dallas, TX 75247 Phone: 214-638-6010 Fax: 214-905-0806
www.appliedair.com

SECTION I - FORWARD

As is the case with any fine piece of equipment, care must be taken to provide the proper attention to the operation and maintenance detail of this machine.

This manual of instructions has been prepared in order for you to become well-acquainted with those details, and in doing so, you will be able to give your Indirect Gas-Fired System the care and attention which any piece of equipment needs and deserves.

Table of Contents

Section I: Forward and Table of Contents 2
Section II: General Information 3
Section III: Installation 4
Section IV: Pre-Start Up 16
Section V: Unit Start Up 18
Section VI: Unit Shut Down 22
Section VII: Troubleshooting 23
Section VIII: Servicing the Burner 31
Section IX: Maintenance Schedule and Lubrication Requirements 39
Section X: Replacement Parts 42

* IMPORTANT NOTICE *

Applied Air assumes no responsibility for loss or damage in transit; therefore, you should protect yourself by following these instructions. Failure to do so is your responsibility.

BILL OF LADING
Save your bill of lading. It is a contract, and you will need it, provided you have to file a loss or damage claim. Remember, claims are outlawed after nine months.

LOSS IN TRANSIT
Before you sign for this shipment, check against the bill of lading, also the transportation company's delivery ticket. Make sure that you get the exact total of articles listed. Should the delivery ticket show more or less items than you are offered, then the carrier's agent must mark the difference on your freight bill before you sign.

VISIBLE DAMAGE IN TRANSIT
If something is damaged, accept the shipment only if the carrier's agent places a notation on your freight bill explaining the nature and extent of damage. Upon inspection of article, make claim to the delivering carrier.

CONCEALED DAMAGE IN TRANSIT
Sometimes transit damage is not noticed until the goods are unpacked. In such cases, notification to the carrier must be made within fifteen (15) days of receipt of shipment. In such cases, save the packages and packing material, then notify the transportation company at once, and request an inspection. When the inspector calls, have him make out and leave a "concealed" bad order report. He is obliged to give one to you. Insist on it.

DISPOSITION OF DAMAGED ARTICLES
Never return damaged articles to us. They are the property of the transportation company when the claim is filled. They will give you disposition instructions.

PACKING
We comply with the packing requirements of the transportation companies, and your bill of lading proved that everything was in good condition when shipped. That bill of lading contract requires them to deliver in perfect condition.

SECTION II - GENERAL INFORMATION

A. Purpose

The purpose of this manual is to present a guide for proper installation, maintenance, and operation of the Indirect Gas-Fired System, and supplement, **but not to replace**, the services of qualified field service personnel to supervise the initial start-up and adjustment of the unit. Persons without previous experience with large commercial and industrial heating equipment should not attempt the initial adjustment and checkout procedure, which is essential before such installations may be considered ready for operation. This manual should be made readily available to all operating personnel as an aid in troubleshooting and proper maintenance. Due to the custom nature of Applied Air equipment, not all possibilities are addressed in this manual. The customer or installer can obtain information from Applied Air's sales representative or the Applied Air factory.

B. Shipping

Base Indirect Gas-Fired units are shipped completely assembled where shipping limitations allow. Optional inlet hoods, filter and /or damper sections, or other large accessories are assembled and shipped mounted and wired whenever possible within limitations of shipping and handling. Some optional accessories shipped separately may require field assembly. Any wired accessories, which have been disassembled for separate shipment, require no additional conduit or wire for field reassembly. All wire leads will be tagged for ease of reconnection in the field.

If the heater and/or accessories cannot be installed immediately, they should be stored in a clean dry environment. If this is not possible and the heater must be stored outdoors, it should be protected from the weather with tarpaulins or plastic coverings. Do not assume that simply covering a unit will keep insects, dust, and condensation out of the unit and critical components. Rotate the fans monthly.

Shipments are made F.O.B. Dallas, Texas by truck. The unit is securely strapped, tied, and blocked to prevent shipping damage. All shipments are checked by an inspector before they are accepted by the carrier. Parts that are shipped un-mounted are noted on the bill of lading. These parts, where feasible, are packaged and shipped with the units. Upon receipt of shipment, all units should be checked against the bill of lading to insure all items have been received. All equipment (and any optional accessories) should be checked carefully for physical damage in the presence of the carrier's representative. If parts are missing or damage has occurred, you should request an inspection, and a claim should be filed immediately with the carrier.

All Indirect Gas–Fired units are given a complete operations test and control circuit checkout before shipment. Copies of the wiring diagram, piping diagram and bill of material are included with each unit shipped. If correspondence with the factory is necessary, please provide the unit model and serial number.

C. Optional Factory Service

Periodic service on any piece of mechanical equipment is necessary for efficient operation. A nationwide service support network is available to provide quick and dependable servicing of make-up air, heating, ventilating, or air handling types of equipment. The factory also offers start-up service, which includes the presence of a service engineer to supervise the initial start-up and adjustment of the equipment and provide instructions for the owner's maintenance personnel in proper operations and maintenance. Consult factory for quotations on periodic or start-up service.

SECTION III - INSTALLATION

Prior to beginning installation of a unit that has been in storage for weeks or months, the unit and its compnents should be closely inspected.

FOR CANADIAN INSTALLATIONS ONLY
1. All installations must conform with local building codes, or in the absence of local codes, with current CAN/CGA-B149-Installation Codes for Gas Burning Appliances and Equipment.
2. All electrical connections must be in accordance with Canadian Electrical Code, Part 1, CSA Standard C22.1.

All electrical connections must conform to the current edition of ANSI/NFPA No. 70 National Electrical Code and applicable local codes: in Canada, to the Canadian Electrical Code, Part 1 CSA Standard C22.1. The following recommendations are not intended to supplant any requirement of federal, state, or local codes having jurisdiction. Authorities having jurisdiction should be consulted before installations are made. Local codes may require additional safety controls and /or interlocks.

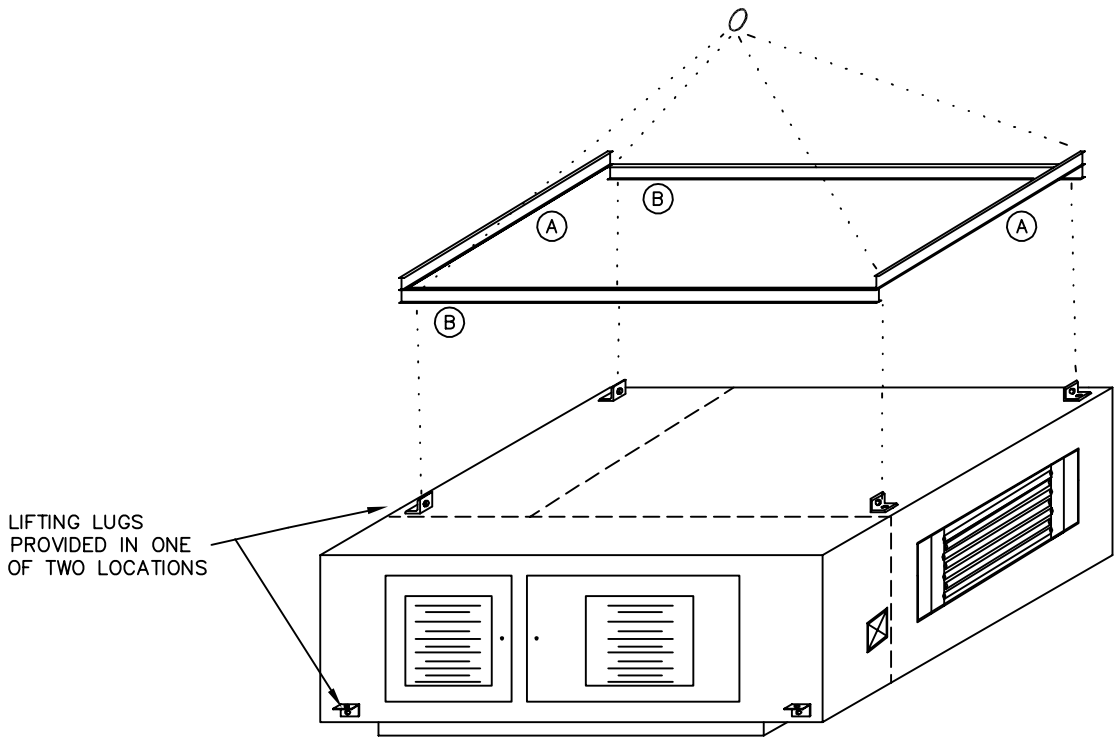
All installations in airplane hangers must be in accordance with current ANSI/NFPA No. 409. All installations in public garages must be in accordance with current NFPA No. 88A and NFPA No. 88B.

CAUTION: Do not install heating system in corrosive or flammable atmospheres! Premature failure of, or severe damage to the unit will result!

CAUTION: Heating system must not be installed in locations where air for combustion would contain chlorinated, halogenated or acidic vapors. If located in such an environment, premature failure of the unit will occur!

A. Handling the Equipment

The Indirect Gas-Fired unit has been designed for rigging and handling through the use of special lifting lugs installed on the top and/or sides of each unit. As explained previously, the basic unit is designed for shipping in one piece where shipping limitations allow. Some optional accessories may require field mounting.



A – USE WHEN LIFTING OVER 3,000 LBS.
B – USE WHEN LIFTING UNDER 3,000 LBS.

C000539

When unloading and setting the unit, use the lifting lugs provided or move the equipment on rollers. Hooks, jacks, or chains must not be used around the casing, main control panel or exterior mounted controls.

During transit, unloading and setting of the unit, bolts and nuts may have become loosened, particularly in the pillow block ball bearing assemblies in the fan section. It is recommended that all nuts and setscrews be tightened. Turn fan shaft by hand to make certain that blower does not rub against blower housing, and that bearing setscrews are tight.

Open the cover on the electrical control box located on the unit and ensure that all connections are tight.

B. Locating the Unit

Prior to locating the unit, authorities having jurisdiction should be consulted before installations are made. Approval permits should be checked against the unit received.

Combustion air shall be provided at a rate of at least 10 CFM, or 1 square inch of free opening, per 1000 BTU per hour of rated input. If a separate mechanical means provides this air, an interlock with the combustion blower shall be provided.

The rated output of gas burning appliances decreases with higher altitudes above 2,000 feet, the furnace shall be de-rated 4 % for each 1,000 feet of altitude above sea level. Factory testing rating plate information is recorded on sea level conditions. High altitude ratings may be obtained by a change in manifold pressure. Appliances must be suitably marked to indicate their altitude adjusted input rating.

Under no circumstances should this equipment be installed in a negatively pressurized space. Consult jurisdictional authority for proper ventilation requirements.

Combustion air containing or recirculation of room air may be hazardous in the presence of:

a) Flammable solids, liquids and gases.
b) Explosive materials (i.e., grain, dust, coal dust. gunpowder, etc).
c) Substances, which may become toxic when, exposed to heat (i.e., refrigerant, aerosols, etc.).

Locate the unit exactly level. Special attention should be given to the duct, electrical, and fuel connection points. Install ductwork with adequate flexible connection to isolate vibration from the ductwork.

All ductwork should have taped or caulked seams. Ductwork should be properly sized so as not to inhibit airflow. This information should be crossed-checked with the position of support beams and stand pipes to insure that clearance dimensions coincide with those of the unit. The minimum clearance to combustible material must be maintained as listed in Table 1

Table 1

Minimum clearance to combustible material, also, consult local codes and regulations.

Clearances to Combustible Material		
	Vertical Units	Horizontal Units
Front*	48 inches	48 inches
Rear	18 inches	18 inches
Right	18 inches	18 inches
Left	18 inches	18 inches
Top	18 inches	18 inches
Floor	Zero	6 inches

*Consider control side as front of unit

In addition to the combustible clearances listed above, access for service should be allowed around the unit. The recommended minimum access clearance is shown in Table 2.

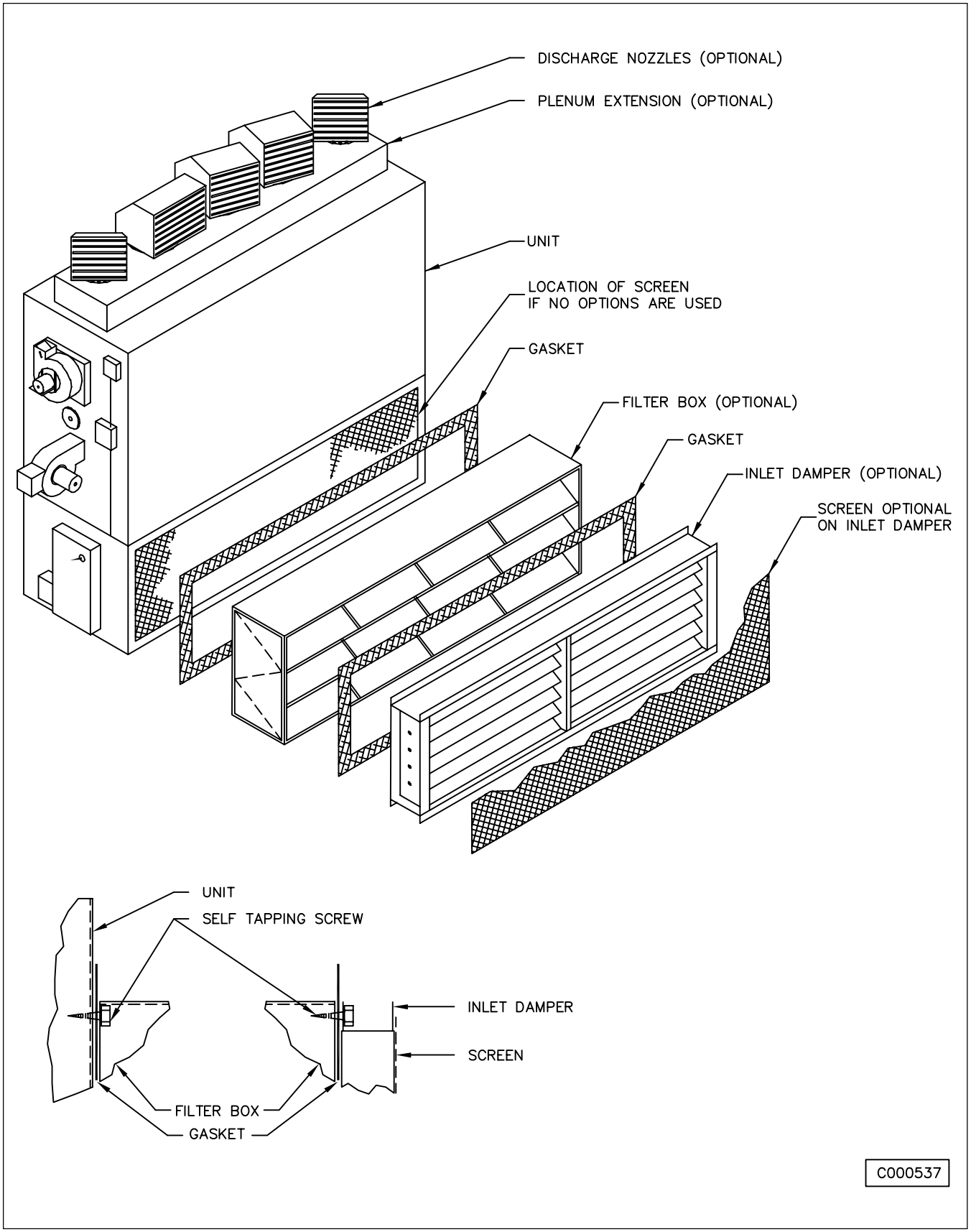
Table 2

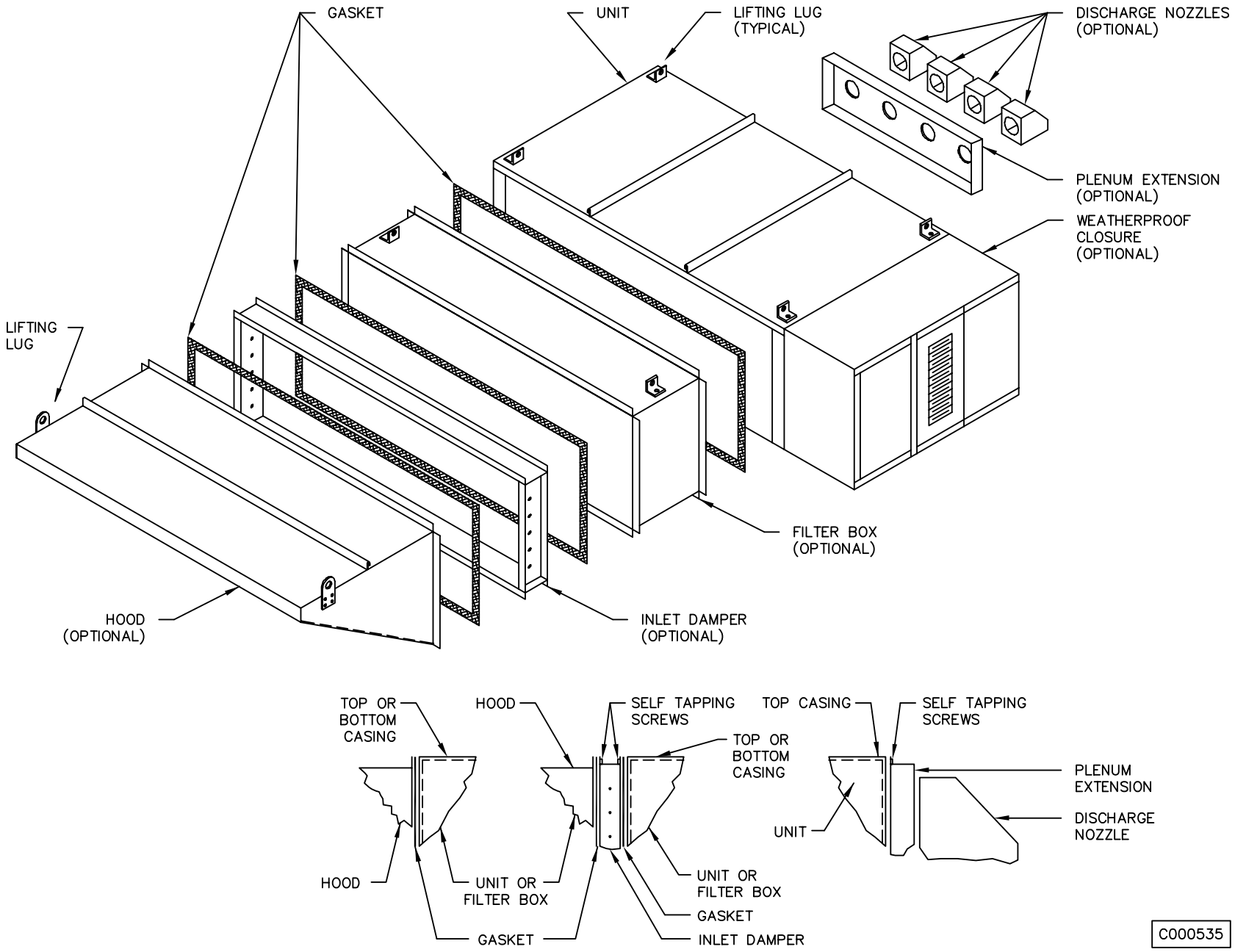
Unit Size	Minimum Access*	Unit Size	Minimum Access*
Up to 1750 MBH Output	36 inches	2000 MBH Output and Larger	50 inches

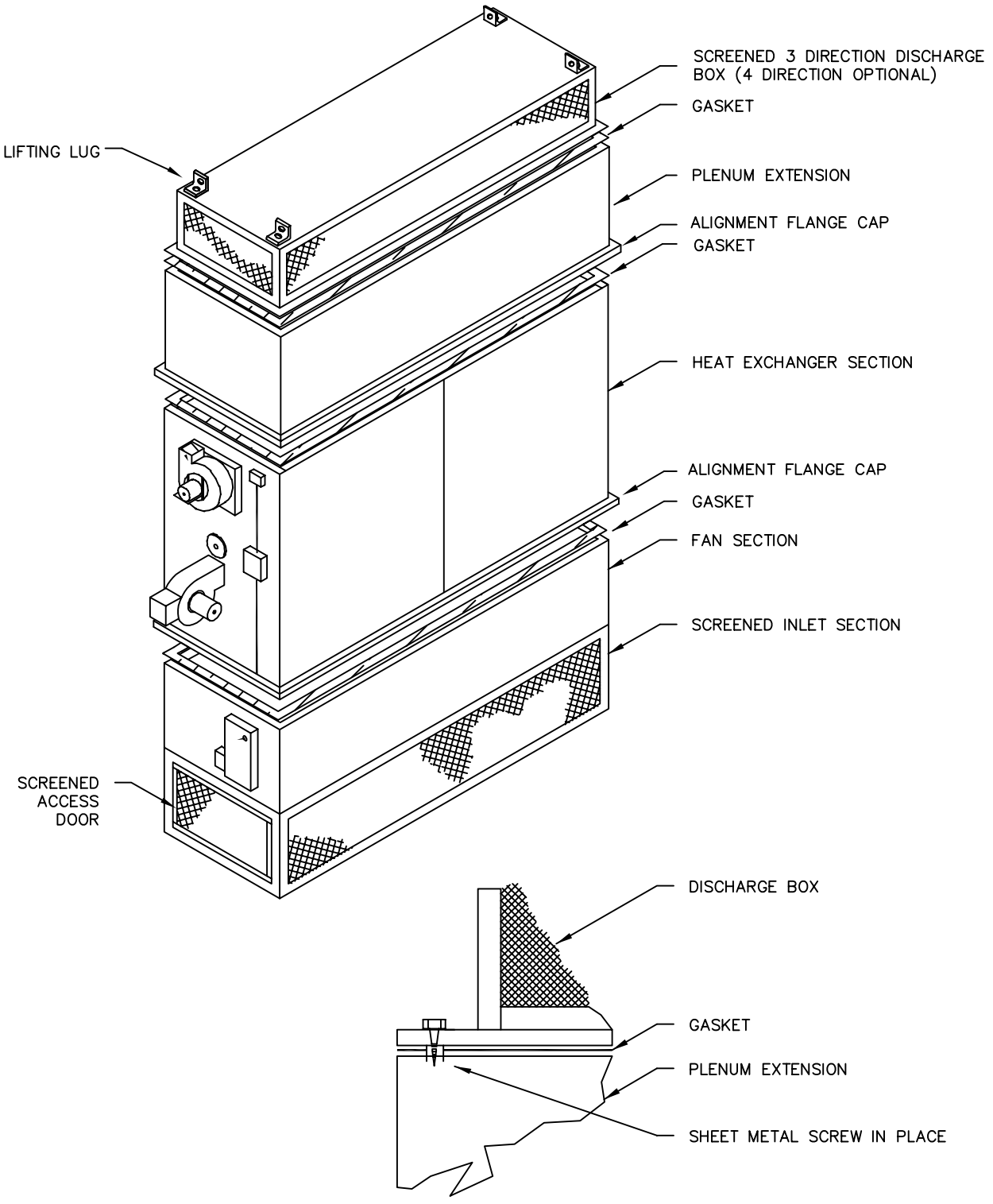
*Optimum clearance for shaft removal for units with centrifugal blowers would be equivalent to cabinet width.

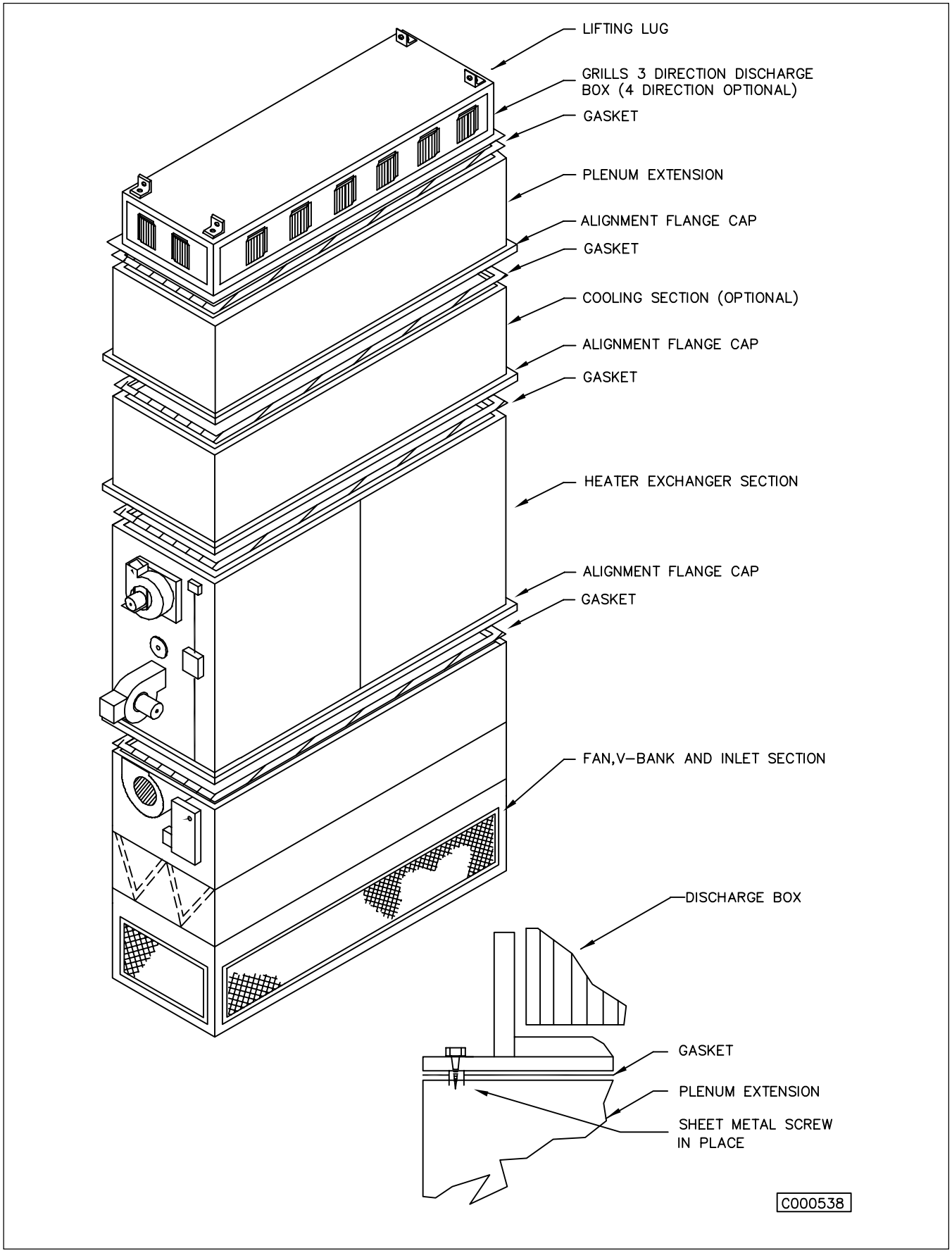
On outdoor curb mounted installations, flash and seal the roof curb to prevent leakage. The cross section of factory provided curb is formed to accept wood nailing strip and insulation provided by others.

It is the customer and installation personnel responsibility to determine if the unit is equipped with all of the safety devices required for the particular application. Safety considerations include the accessibility of the unit to non-service personnel, the provision of electrical lockout switches, maintenance procedures, and automatic control sequences. Clearly mark all emergency shut off devices.


DISCHARGE NOZZLES (OPTIONAL)
PLENUM EXTENSION (OPTIONAL)
UNIT
LOCATION OF SCREEN
IF NO OPTIONS ARE USED
GASKET
FILTER BOX (OPTIONAL)
GASKET
INLET DAMPER (OPTIONAL)
SCREEN OPTIONAL
ON INLET DAMPER
UNIT
SELF TAPPING SCREW
INLET DAMPER
SCREEN
FILTER BOX
GASKET
C000537


GASKET
UNIT
LIFTING LUG (TYPICAL)
DISCHARGE NOZZLES (OPTIONAL)
PLENUM EXTENSION (OPTIONAL)
WEATHERPROOF CLOSURE (OPTIONAL)
LIFTING LUG
FILTER BOX (OPTIONAL)
HOOD (OPTIONAL)
INLET DAMPER (OPTIONAL)
TOP OR BOTTOM CASING
HOOD
SELF TAPPING SCREWS
TOP OR BOTTOM CASING
TOP CASING
SELF TAPPING SCREWS
PLENUM EXTENSION
DISCHARGE NOZZLE
UNIT
HOOD
UNIT OR FILTER BOX
GASKET
UNIT OR FILTER BOX
GASKET
INLET DAMPER
C000535


SCREENED 3 DIRECTION DISCHARGE BOX (4 DIRECTION OPTIONAL)
GASKET
LIFTING LUG
PLENUM EXTENSION
ALIGNMENT FLANGE CAP
GASKET
HEAT EXCHANGER SECTION
ALIGNMENT FLANGE CAP
GASKET
FAN SECTION
SCREENED INLET SECTION
SCREENED ACCESS DOOR
DISCHARGE BOX
GASKET
PLENUM EXTENSION
SHEET METAL SCREW IN PLACE
C000536


LIFTING LUG
GRILLS 3 DIRECTION DISCHARGE BOX (4 DIRECTION OPTIONAL)
GASKET
PLENUM EXTENSION
ALIGNMENT FLANGE CAP
GASKET
COOLING SECTION (OPTIONAL)
ALIGNMENT FLANGE CAP
GASKET
HEATER EXCHANGER SECTION
ALIGNMENT FLANGE CAP
GASKET
FAN,V–BANK AND INLET SECTION
DISCHARGE BOX
GASKET
PLENUM EXTENSION
SHEET METAL SCREW IN PLACE
C000538

DIRECTIONS FOR FIELD ASSEMBLING AND WEATHERPFOOFING SECTIONS

1. Apply gasket material to the end of the first section (blower, discharge, heater, ets). (See Fig. 1.)

NOTE: One roof cap is attached to a standing seam on each section for shipping purposes only. It will be necessary to remove this PRIOR TO SLIDING SECTIONS TOGETHER. Failure to do so may damage seams, preventing proper seal.

2. Slide adjoining section against the gasketed first section. If bolt holes are provided, bolt the sections together tightly. If bolt holes are not provided, use furniture clamps to pull sections TIGHTLY together. Sections, whether bolted or not, will be held together and sealed by the standing seams and hugger strips (Fig. 2), which will be attached later.

3. Once the sections are connected, apply caulking or silicone sealant along the standing roof seam (Fig. 3) and side seams where the sections come together. (Fig.1) It is mandatory to seal the roof and side seams along the entire outside of the unit, and it is strongly suggested that the seams also be sealed along the inside of the unit, if possible.

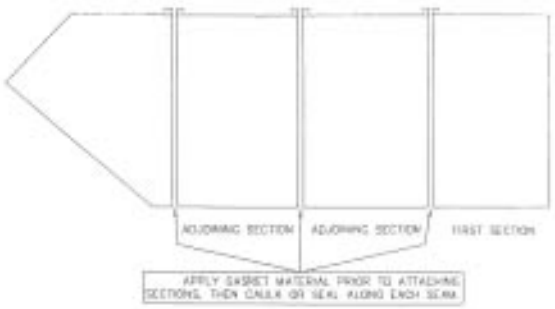
4. Apply caulking material along the top of both sides of the standing roof seam (Fig.4). Place roof cap (Fig. 5) on top of the seam and secure it with two rows of TEK screws (one down each side). spaced approximately 8-10 inches apart down the entire length of the seam.

5. Apply two strips of factory supplied tacky tape (one down each side) to the back side of each hugger strip (Fig. 2). Secure hugger strip with two rows of TEK screws (one down each side) spaced approximately 8-10 inches apart down the entire length of the seam.

6. After hugger strips are installed, caulk around the edges to complete the seal.

7. Repeat this process for each section as it is attached. The number of sections varies by application.

NOTE: HOOD REQUIRES ADDITIONAL, *INSTALLER PROVIDED*, SUPPORT.


ADJOINING SECTION
ADJOINING SECTION
FIRST SECTION
APPLY GASKET MATERIAL PRIOR TO ATTACHING SECTIONS, THEN CAULK OR SEAL ALONG EACH SEAM
FIG.1

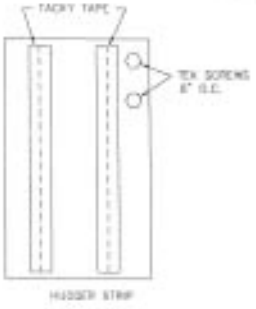


FIG.2

FIG.3

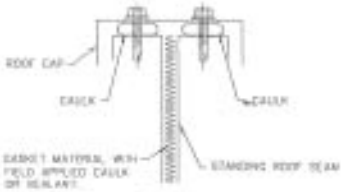


FIG.4

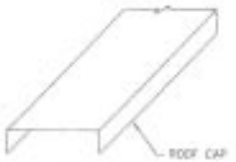
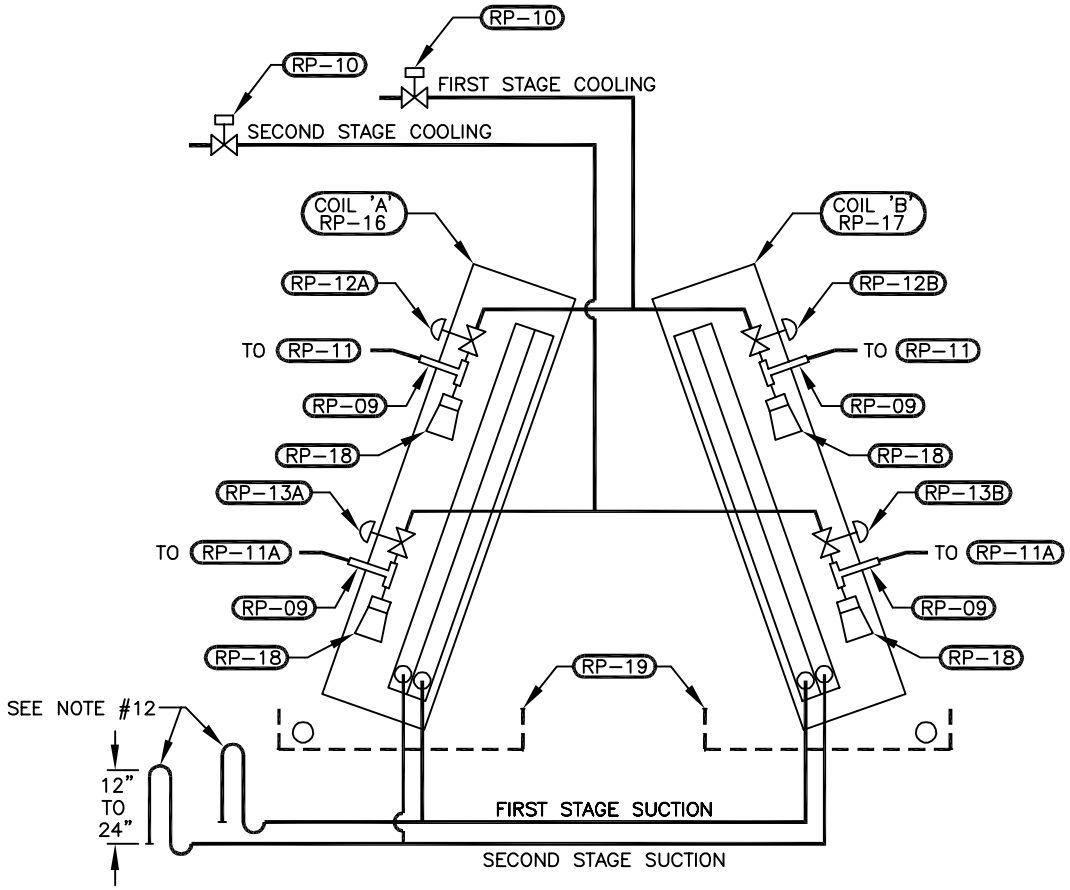


FIG.5



A-FRAME COIL ASSEMBLY END ELEVATION

THE ABOVE PIPING SCHEMATIC SHOULD BE USED AS A GUIDE ONLY.

PROPER ENGINEERING DESIGN OF THE OVERALL REFRIGERATION SYSTEM MAY DICTATE AN ALTERNATE PIPING SCHEMATIC BE USED TO THE ONE ILLUSTRATED ABOVE.

GENERAL NOTES:

1. RECOMMEND FIRST STAGE AND SECOND STAGE OF COOLING BE PROVIDED WITH HOT GAS BYPASS.
2. ALL PIPING TO BE ACR TYPE 'L' COPPER.
3. ALL PIPING TO BE PITCHED IN THE DIRECTION OF REFRIGERANT FLOW. PITCH TO BE 1 INCH PER 10 FEET.
4. ALL SUCTION LINES TO BE INSULATED.
5. LIQUID LINE FILTER/DRIER, SIGHT GLASS, SUCTION LINE FILTER/DRIER, ISOLATION VALVES, FITTINGS, DISCHARGE VIBRATION ABSORBER, ACCUMULATORS AND OTHER AVAILABLE SYSTEM OPTIONS ARE NOT SHOWN.
6. RECOMMEND LONG RADIUS ELBOWS BE USED TO MINIMIZE SYSTEM PRESSURE DROP.
7. RECOMMEND LIQUID LINES FOR R-22 BE SIZED FOR A MAXIMUM PRESSURE DROP OF 6 PSIG.
8. RECOMMEND SUCTION LINES FOR R-22 BE SIZED FOR A MAXIMUM PRESSURE DROP OF 3 PSIG.
9. RECOMMEND CONDENSOR SUBCOOLING CIRCUIT FOR R-22 BE CAPABLE OF SUBCOOLING LIQUID BETWEEN 12 TO 19°F.
10. CONNECT 1/4" O.D. EXTERNAL EQUALIZING LINE GENERALLY LOCATED IN EACH SUCTION HEADER OF EACH DX COIL TO THE APPROPRIATE THERMAL EXPANSION VALVE (TXV).
11. SENSING BULB FROM THERMAL EXPANSION VALVE (TXV) TO BE LOCATED ON THE SIDE OF A HORIZONTAL PORTION OF THE DX COILS' SUCTION LINE PIPING AT AN ANGLE OF APPROXIMATELY 120° FROM VERTICAL. DO NOT LOCATE SENSING BULB ON ANY PIPING USED IN A TRAP OR DOWNSTREAM OF A TRAP.
12. INSTALL TRAP IN SUCTION LINE AS ILLUSTRATED IF COMPRESSOR IS LOCATED BELOW THE THE DX COIL.
13. ALL COIL SPECIALTIES AND REFRIGERANT PIPING SHOWN OTHER THAN THE REFRIGERANT DISTRIBUTOR AND ANY OTHER REQUIRED REFRIGERATION SYSTEM SPECIALTIES ARE TO BE PROVIDED BY AND INSTALLED IN THE FIELD BY OTHERS.

COMPONENT IDENTIFICATION

RP-09	HOT GAS BYPASS TEE
RP-10	LIQUID LINE SOLENOID VALVE
RP-11	HOT GAS BYPASS VALVE – FIRST STAGE
RP-11A	HOT GAS BYPASS VALVE – SECOND STAGE
RP-12A	THERMAL EXPANSION VALVE (TXV-1A) CIRCUIT #1 – COIL 'A'
RP-13A	THERMAL EXPANSION VALVE (TXV-2A) CIRCUIT #2 – COIL 'A'
RP-12B	THERMAL EXPANSION VALVE (TXV-1B) CIRCUIT #1 – COIL 'B'
RP-13B	THERMAL EXPANSION VALVE (TXV-2B) CIRCUIT #2 – COIL 'B'
RP-16	DX EVAPORATOR COIL 'A' – INTERTWINED
RP-17	DX EVAPORATOR COIL 'B' – INTERTWINED
RP-18	REFRIGERANT DISTRIBUTOR
RP-19	CONDENSATE PAN PROVIDED WITH DRAIN CONNECTIONS ON BOTH ENDS

P-000971

C. Location of Accessories

Where applicable, standard or optional accessories will be placed inside the fan section of the unit for shipment and must be removed and installed by the mechanical or electrical contractor. Remotely located discharge or inlet dampers must be equipped with an end switch and interlocked to insure maximum design opening before starting and running circuits may be energized.

D. Electrical Connections

Warning: Open all disconnect switches and secure in that position before wiring unit. Failure to do so may result in personal injury or death from electrical shock.

Warning: Controls must be protected from water. Do not allow water to drip on the electrical controls.

Note: Before installing any wiring, check the unit rating plate for power supply voltage, and minimum amperage.

All wiring must comply with all applicable local, state, provincial, and national electric codes. Since shipment of unit may require disassembly after factory check and test, reconnection of some electrical devices will be required in the field. Connect electrical wires (supplied in factory furnished conduit) to appropriate terminals. All leads are tagged to facilitate field connections. See wiring diagram provided with equipment. Complete all wiring to any optional accessories as shown on unit bill of material and electrical wiring diagram as required before applying voltage to the unit.

Entry location for all field-installed and control wiring is through the control panel.

If optional disconnect is not furnished with heater, the field provided disconnect must be of the proper size and voltage. Refer to unit nameplate for minimum circuit ampacity and voltage. The disconnect must be installed in accordance with Article 430 of the current edition of ANSI/NFPA No. 70 National Electrical Code, and applicable local codes; in Canada, to the Canadian Electrical Code, Part 1, CSA Standard C22.1.

Check the supply voltage before energizing the unit. The maximum voltage variation should not exceed ±10 %. Phase voltage unbalance must not exceed 2%.

NOTE: Should any original wire supplied with the heater have to be replaced, it must be replaced with wiring material having a temperature rating of at least 105°C.

E. Venting

All venting installations must conform to Part 7, Venting of Equipment in the current version of the National Fuel Gas Code ANSI Z223.1, or applicable provisions of local building codes.

All Indirect Fired Units must be vented. Each unit must have an individual vent pipe and vent terminal.

Recommended vent pipe is 14 Gauge Series 400 Stainless Steel. Type “B” vent is not acceptable. The customer must provide a rain cap or weather cap. DO NOT support the weight of the stack on the induced draft fan housing of the unit. Insulate single wall vent pipe exposed to cold air or running through unheated areas.

The venting system for these heaters shall terminate at least four feet below, four feet horizontally from, or one foot above any door, window, or gravity air inlet into any building. All vents must be able to maintain a minimum of – 0.20’’ W.C. in high fire.

Through the wall vents for these heaters shall not terminate over public walkways or over an area where condensate or vapor could create a nuisance or hazard or could be detrimental to the operation of regulators, relief valves, or other equipment.

The vent pipe diameter must be as shown in specification chart on following page. An adaptor from induced draft fan housing to vent pipe must be field supplied.

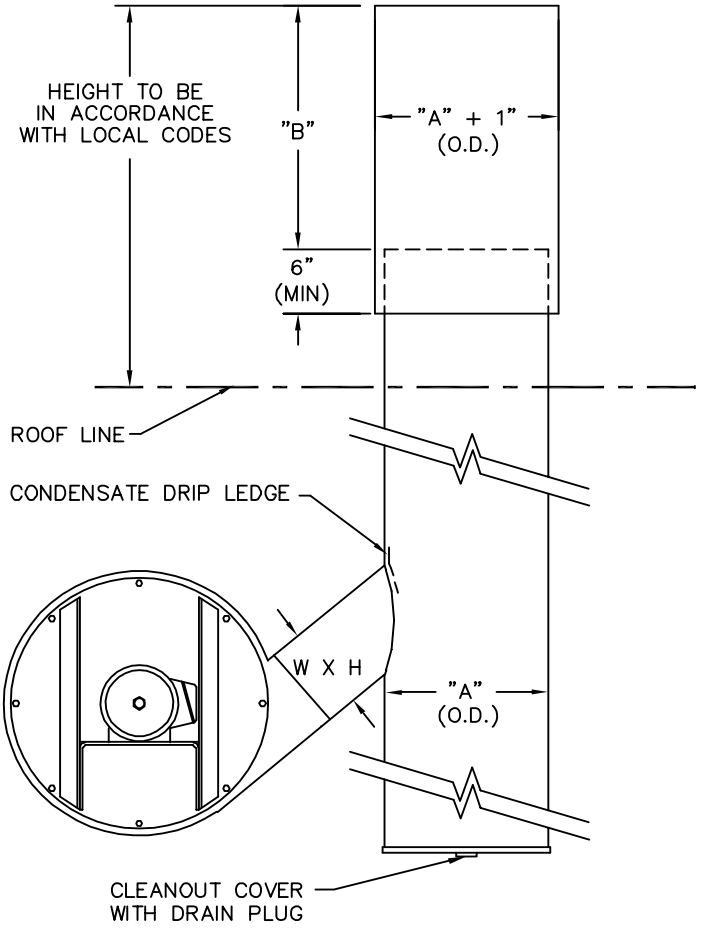
The vent pipe should be fitted with a drip leg with a clean out and a drain plug in the bottom. The vent pipe shall be constructed so that any water that collects in the stack will remain in the stack drip leg and not drain into the induced draft fan housing. Be sure drip leg is made so water will not fall on heater controls when drain plug is removed.

Pitch horizontal pipes upward 1/4 inch per foot toward outlet for condensate drainage. Support horizontal runs as required to prevent sagging.

Vents should terminate that would not cause a down draft to occur. This could affect the negative pressure required in the heat exchanger. Do not install dampers or other restrictive devices in the flue vent pipe.

The stack should not be installed in such a manner that access to the components is obstructed. Guy wires may be required to brace the stack above rooflines.

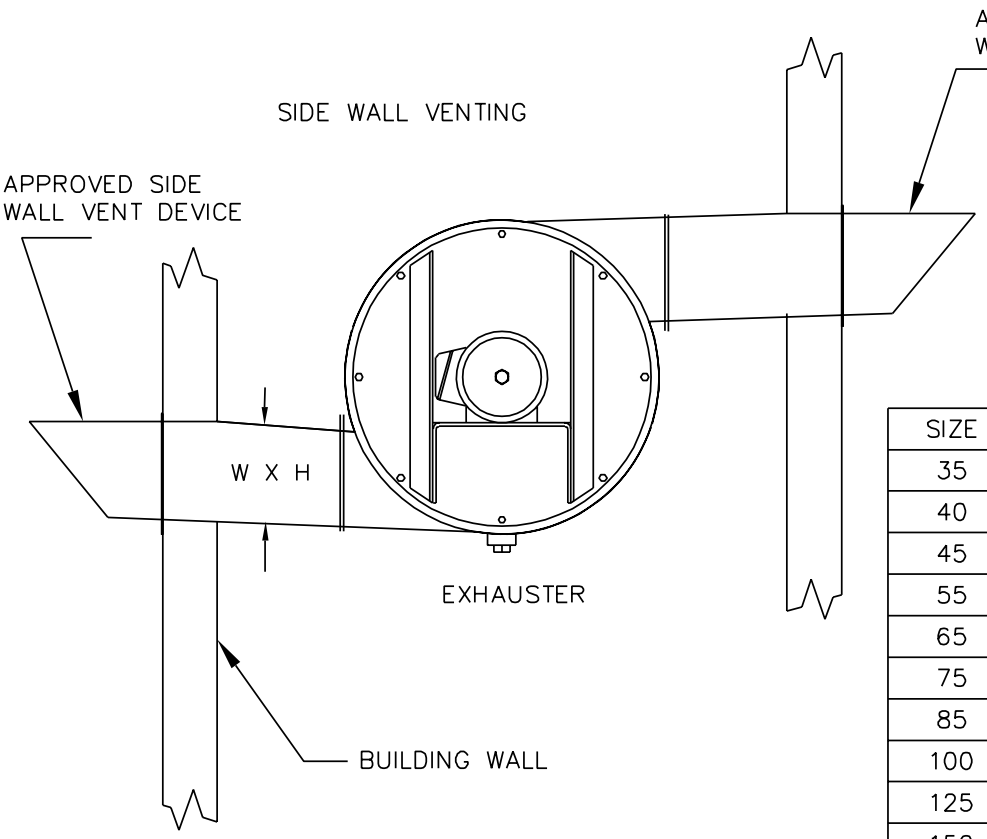
Outdoor units are supplied with a stack. The stack shall have a minimum of at least 36” clearance to combustible materials.



DIMENSIONS				
SIZE	"A"	"B"	"H"	"W"
35	8	32	6–3/8	6–1/4
40	8	32	6–3/8	6–1/4
45	8	32	6–3/8	6–1/4
55	8	32	6–3/8	6–1/4
65	10	40	7–3/8	7
75	10	40	7–3/8	7
85	10	40	7–3/8	7
100	10	40	7–3/8	7
125	12	48	9–3/8	9
150	12	48	9–3/8	9
175	12	48	9–3/8	9
200	14	56	9–3/8	9
250	16	64	11–1/8	10–5/8
275	16	64	11–1/8	10–5/8
300	16	64	11–1/8	10–5/8
325	16	64	11–1/8	10–5/8
350	16	64	11–1/8	10–5/8
400	16	64	11–1/8	10–5/8
500	18	72	11–1/8	10–5/8
600	18	72	11–1/8	10–5/8

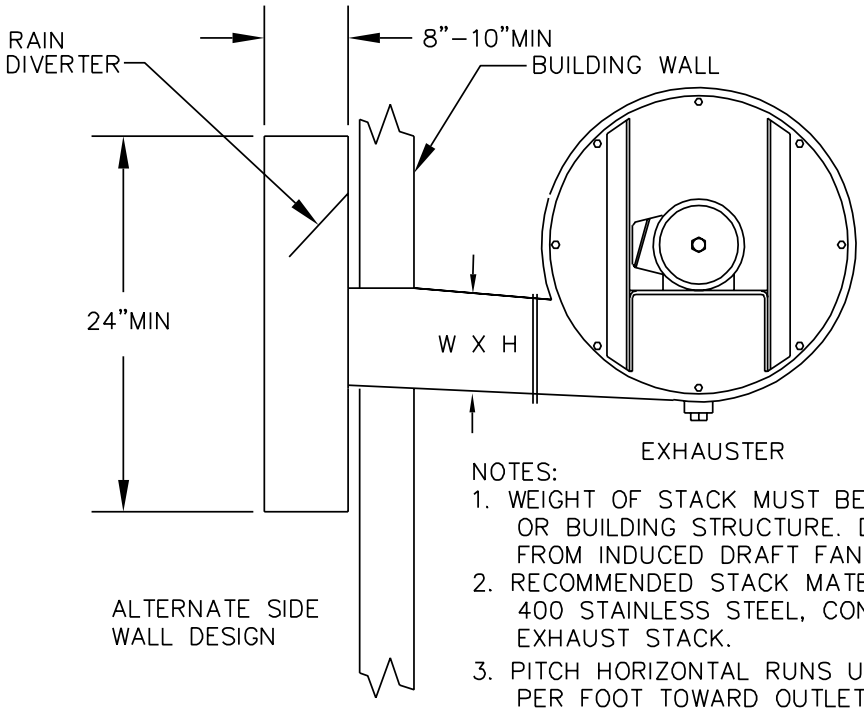
NOTES:
1. WEIGHT OF STACK MUST BE SUPPORTED FROM FLOOR OR BUILDING STRUCTURE. DO NOT SUPPORT STACK FROM INDUCED DRAFT FAN.
2. RECOMMENDED STACK MATERIAL IS 14 GAGE SERIES 400 STAINLESS STEEL, CONTINUOUSLY BUTT WELDED STACK.

C000541



DIMENSIONS

SIZE	"H"	"W"
35	6-3/8	6-1/4
40	6-3/8	6-1/4
45	6-3/8	6-1/4
55	6-3/8	6-1/4
65	7-3/8	7
75	7-3/8	7
85	7-3/8	7
100	7-3/8	7
125	9-3/8	9
150	9-3/8	9
175	9-3/8	9
200	9-3/8	9
250	11-1/8	10-5/8
275	11-1/8	10-5/8
300	11-1/8	10-5/8
325	11-1/8	10-5/8
350	11-1/8	10-5/8
400	11-1/8	10-5/8
500	11-1/8	10-5/8
600	11-1/8	10-5/8



NOTES:

1. WEIGHT OF STACK MUST BE SUPPORTED FROM FLOOR OR BUILDING STRUCTURE. DO NOT SUPPORT STACK FROM INDUCED DRAFT FAN.
2. RECOMMENDED STACK MATERIAL IS 14 GAGE SERIES 400 STAINLESS STEEL, CONTINUOUSLY BUTT WELDED EXHAUST STACK.
3. PITCH HORIZONTAL RUNS UPWARD $\frac{1}{4}$ INCH PER FOOT TOWARD OUTLET FOR CONDENSATE DRENAGE. SUPPORT HORIZONTAL RUNS AS REQUIRED TO PREVENT SAGGING.

C-000563

F. Field Piping

All gas piping must be in accordance with the requirements outlined in the National Fuel Gas Code – ANSI Z223.1. It is required that a ground union be installed adjacent to the manifold for easy servicing. A drip leg and/or filter should be provided upstream of the unit's inlet gas connection. An additional shut-off must be located external of the unit's enclosure where required by local code. The location of this valve must comply with all local codes. A 1/8 inch N.P.T. plugged tapping, accessible for test gauge connection, must be installed immediately upstream of the gas supply connection to the unit.

WARNING: To avoid equipment damage or possible personal injury, do not connect gas piping to this unit until a supply line pressure/ leak test has been completed. Connecting the unit before completing the pressure/leak test may damage the unit gas valve and result in a fire hazard.

DANGER: Never use an open flame to detect gas leaks. Explosive conditions may exist which would result in personal injury or death.

The gas line should be supported so that no strain is placed on the unit. Pipe compounds, which are not soluble to liquid petroleum gases, should be used on threaded joints.

The appliance and its individual shutoff valve must be disconnected from the gas supply piping system during any pressure testing of that system at test pressures in excess of $^1/_2$ PSIG.

The appliance must be isolated from the gas supply piping system by closing it's individual manual shutoff valve during any pressure testing of the gas supply piping system at test pressure equal to or less than $^1/_2$ PSIG.

Correctly sized piping must be run to the unit**.**

Please note that gas line pressure must be as shown on specification plate when unit is operating at full input. The high-pressure regulator and relief valve should be, if possible, mounted at least 5 to 10 feet upstream from the appliance regulator on the unit (if applicable).

G. Field Wiring and Remote Control Installation

1. If the optional low temperature limit was not an integral part of the heater, the factory recommends that a low temperature limit control be installed in areas where freeze protection is needed in the event of burner shut down.
2. Connect the power lines to the line side of the power distribution block or optional main disconnect switch.
3.Field wiring is indicated on the wiring diagram, typically dashed lines. Where field wiring of the control circuit is required, take care to size the wires for a maximum 10% voltage drop. The VA rating of the transformer should be the maximum load.
4. Mount and wire remote control panel, thermostat temperature sensors, and any other field-installed controls as indicated on the unit control-wiring diagram.
5. Connect all wiring to the appropriate field wiring terminal and any shielded or twisted wires as indicated on the unit control-wiring diagram.

H. Locating Temperature Controls

The room or outdoor thermostats should be mounted where they will not be subjected to direct impact of the heated air or radiant heat from the sun. It is also recommended that thermostats, especially those with mercury bulb contacts, be mounted on a vibration free surface. The sides of building columns, away from the heater or interior walls, are usually the location best suited for mounting thermostats.

Controls with outdoor bulbs require that the outdoor bulb be shielded from direct radiation from the sun. Unit mounted sensors are factory located and mounted.

I. Drains and Traps

Some furnaces may be supplied with condensation removal pipe connections. Condensate from the heat exchanger is acidic and may contain chemical compounds requiring special drainage. The drain must be installed in accordance with all plumbing codes. The condensate is to be drained via PVC or steel pipe with an indirect connection to the plumbing wastes. Where a condensate neutralizer is used, an overflow shall be provided such that condensate will be directed to the drain in the event that the neutralizer becomes plugged. Indoor units typically require a condensate trap to be installed to prevent combustion gasses from entering the space. Outdoor units may require installing a heat-trace or special attention to drains to prevent freezing and clogging of the drain line.

Since the condensate is drained by gravity, avoid long runs of drain piping. If a long run of trapping cannot be avoided or the piping has water flow restrictions such as several elbows, and extra height to provide enough hydrostatic head to overcome the frictional losses. Always slope piping down a minimum of 1/8" per foot in the direction of the flow.

SECTION IV – PRE START-UP

Pre Start-Up

The owner's representative or equipment operator should be present during start-up to receive instructions on care and adjustments of the equipment.

All equipment has been factory tested, adjusted, metered and inspected to meet conditions set at the time the order was placed. Only minimal adjustments should be required. All information in this service manual is typical. All products are semi-custom and changes may occur. The following procedures should be preformed to assure the unit has not been damaged or misaligned during shipping.

Note: All servicing and adjustments to the Indirect Gas Fired unit should be preformed by a qualified service engineer.

Caution: Line side of disconnect switch may be energized.

Perform a visual inspection internally and externally of the unit to make sure no damage has occurred, and everything is secure.

Remove all shipping blocks, brackets, and bolts from bases on units with optional isolation base. Check that system ductwork (if applicable) is installed properly and free from obstructions. Check to make sure all fans, props, and blowers turn freely in their housing. Check all wiring for loose connections and tighten if necessary.

Inspect all fan and motor bearings and lubricate if necessary. Optional extended lube lines are shipped filled from the factory.

Inspect sheaves and belts for tightness, tension and alignment. Do not over tighten belts. Inspect setscrews on bearings and fans for tightness.

Caution: OVER GREASING BEARINGS WILL RUPTURE GREASE SEALS

Before starting up this equipment, study and familiarize yourself with the wiring diagram, sequence of operation, flame safeguard, control components, gas train, and burner.

Check any dampers or mixing boxes (if supplied). Make certain that all damper linkage is free to move and no binding will occur. If dampers are of the modulating type, check control capillary tubes to insure that the tubes and bulbs are in the proper location and will not rub against any other parts.

Check to make sure all vent lines (if applicable) are run to atmosphere on gas regulators and pressure switches. Vent lines should terminate outside the building, with a turndown elbow and bug screen. Vent limiters may be used which do not require vent lines to be run. If vent lines are even partially plugged, this will interfere with the proper venting of pressure control valves.

Check to make sure all filters, accessories, and ship loose items are installed correctly.

Check to make sure the flue stack is installed properly and free from obstruction. Check to be sure that the induced draft damper is approximately 75% open.

Check all thermostats for normal operation.

Check to make sure all manual reset safety devices have been reset, and limits are in their normal operating position.

Check to make sure all doors and inspection panels are secured or closed.

Remove shipping screw from rear relief door (if applicable).

Check all gas piping for leaks using a soap bubble solution. The most common types of problems found relative to the gas train itself is foreign material within the gas piping. This will interfere with the proper operation of the gas train components and burner. Purge all air from gas lines per gas codes.

Check that all manual gas valves are closed.

Caution: Do not attempt to start the burner when furnace is full of vapor or combustion chamber is very hot.

Caution: At no time should you stand in front of the relief door.

Connect test instruments, thermometers, and meters on the furnace and controls to measure and record the appropriate data.

SUGGESTED TOOLS AND INSTRUMENTS

Volt/Ohm meter
Tachometer
Stack & Temperature Thermometer
Gas Pressure Gauge
Ammeter/Amprobe (or equal)
U-Tube Manometer (0 – 10" W.C.) Two Required
Flue Gas Test Equipment
Standard Hand Tools
D.C. Volt Meter

SUGGESTED CONTROLS SETTINGS

FL-01 Fan Control……..…….... 95° – 110° F
FL-02 High Limit (IFR Down Discharge) ...…….165° F
FL-02 High Limit (All Other Units) ……...……200° F
FL-04 Auxiliary High Limit ……...……210° F
PS-01 Draft Proving Switch.....Adjust to field condition
PS-02 Burner Proving Switch..Adjust to field condition
PS-04 Low Gas Pressure Switch……..1.0" W.C.
PS-07 High Gas Pressure Switch……125% above burner firing rate
PS-10 Main Air Proving Switch Adjust to field condition
PS-12 Clogged Filter Switch….Adjust to field condition
RE-21 Time Clock……..…Customer Discretion
TC-01 Room Thermostat ……. Customer Discretion
TC-02 Modulating Discharge Ductstat…… 70° F
TC-03 On-Off Inlet Ductstat……..….65° F
TC-06 High Limit Discharge Ductstat…… 100° F
TC-07 Low Limit Discharge Ductstat……..…60° F
TC-08 Freeze Thermostat……...45° F & 3 Minutes
TC-09 Night Setback Thermostat.Customer Discretion

BEFORE ATTEMPTING TO START THE HEATER, READ THE TYPICAL SEQUENCE OF OPERATION AS SHOWN BELOW:

Typical Sequence Of Operations Note: This sequence is written for only the burner safety and operating portion of the heater. Other control systems for dampers, mixing boxes, and temperature controls are included in the unit typical sequence of operation and / or wiring diagram:

1. With main supply air fan(s) on, thermostat calling for heat, and all switches and operating controls in their normal position, the exauster motor and burner motor will run and "pre-purge" the combustion chamber. Pre-purge timing is not adjustable and is approximately 90 seconds.

2. With pre-purge timing complete, the pilot solenoid valve and ignition transformer are energized. The pilot flame will be established and sensed by the flame sensor.

3. Ignition transformer is de-energized and pilot valve remains on.

4. Main fuel valve(s) will open. The main burner flame will be established.

5. Pilot valve is de-energized. (This is only on heaters with interrupted pilots).

6. Once thermostat is satisfied, the main fuel valve(s), burner motor, and exhauster motor will be de-energized. Main supply air fan(s) will continue to run.

SECTION V – UNIT START-UP

Check the incoming line voltage to match unit nameplate rating. If voltage is over ±10% of nameplate rating or phase voltage unbalance is over 2%, notify contractor or the power company.

If power supply meets requirements turn main disconnect switch on. Turn Fan "on-off" switch to "on" position. Inlet shut-off damper(s) (if applicable) opens, after end switch has proven damper is open the blowers or props run.

Turn Fan "on-off" switch to "off" position. Check supply fans for proper rotation. The burner and induced draft fan rotation can be checked when the heat section is started.

NOTE: To change rotation of the fans, simply interchange any two (2) of the line leads of the motor starter for 3 phase motors. On single-phase motors, refer to motor nameplate.

Turn Fan "on-off" switch to "on" position. Check for proper fan RPM. Check that all amp draws do not exceed nameplate ratings and overloads are set to nameplate amps.

Check to make sure all dampers and controls are working properly.

Turn Fan "on-off" switch to "off" position.

Make sure all manual gas shut-off valves are still in the closed position.

Setting Pilot

NOTE: Adjust inlet gas pressure on supply line where the regulator has been installed to match rating plate on unit.

Connect D.C. voltmeter to pilot flame test jacks located on flame safeguard relay.

Connect manometer to pilot test tee (if applicable).

Set all thermostats to call for heat. Set inlet ductstat (if applicable) above outside air temperature.

Place run/test switch on the flame safeguard relay in the "test" position at the appropriate time (if applicable).

Open first main gas shut-off valve slowly. The last main gas shut-off valve before burner must remain closed at this time. Reset high-low gas pressure switches (if applicable).

Turn Fan and Heat-Off-On switches to the On position and check rotation of burner and induced draft fans, amps, and overload settings.

If limits and all safety controls are closed, the burner and induced draft fan will run for 90 seconds before ignition trial as a pre-purge cycle. Open pilot gas shut-off valve slowly.

Make sure that the combustion air and pilot gas pressure is sufficient to provide instant ignition, a stable flame, and flame signal. Cycle pilot several times to insure reliability.

NOTE: Frequently the cause of pilot problems relates to gas pressures that are too high and/or air dampers that are closed too far. This causes a fuel rich mixture.

NOTE: 3 or 4 trials may be needed to purge air from pilot line.

Watch D.C. voltmeter carefully. The reading should be steady and between 2.0 and 5.0 Volts D.C. If the reading is too low, slowly turn the needle valve in or out until satisfactory flame signal is obtained (See separate literature for testing of flame safeguard).

NOTE: Pilot regulator adjustment may be necessary if the adjustment of the needle valve does not yield the required flame signal.

With pilot now adjusted, you can now shut down the burner by turning the Heat "on-off" switch to the "off" position.

Setting Main Flame

Install one manometer at test port on the last tee of the burner manifold and one at the relief door.

Place the Run/Test switch on the flame safeguard relay to the Run position at the appropriate time (if applicable).

Restart unit. After the pilot proves the main automatic fuel valves will be energized. Slowly open the last gas shut-off valve and the burner should light immediately.

CAUTION: If main flame does not light within a few seconds after pilot flame is established, shut the burner down and repeat steps. You may have to eliminate air from the main gas line. The main gas pressure and / or burner air setting may also need to be readjusted.

If flame signal drops significantly when main gas valves open, slightly increase pilot gas pressure to attain a steady flame signal.

After the burner lights; adjust gas pressure regulator, using a manometer, and combustion air damper to match firing rate shown on unit nameplate. Make sure the thermostat and gas valves are in high fire.

These units have an induced draft fan, a minimum of -0.20” W.C. must be maintained at the relief door, simultaneously while setting the fuel to air pressure on the burner at full input. This is done by changing the damper setting at the induced draft fan outlet. Be sure to lock down the locking quadrant when you are done.

Check all gas piping again for leaks using a soap bubble solution.

On-Off Operation

Check to make sure operating thermostat cycles burner and induced draft fan.

See final checks and adjustments.

High-Low-Off Operation

Turn the two stage thermostat down slowly until main gas valve begins to drive closed (low fire) or the power on the second stage may be disconnected.

NOTE: Low fire rate should be set at approximately 50% of high fire.

CAUTION: Too low of an input setting will cause condensation of the flue gases.

To reset low fire, remove the cover from the Two Stage gas valve actuator and using the wrench provided readjust the internal cam setting.

Check to make sure Two Stage thermostat cycles burner and induced draft fan.

See final checks and adjustments.

Modulating Operation

Set high fire by adjusting main gas regulator and by the high fire adjusting screw on the butterfly valve.

Turn all modulating thermostats to their lowest setting without turning the burner off, or with power off remove the coil wire on low fire hold relay and restart burner.

Observe flame as burner modulates.

NOTE: Flame should modulate slowly and evenly throughout the entire travel, although flame may become somewhat "dirty" during travel. If stopped at any point, proper combustion should resume.

Observe low fire, it should be substantial enough to maintain proper combustion and be within the designed turndown range of the burner.

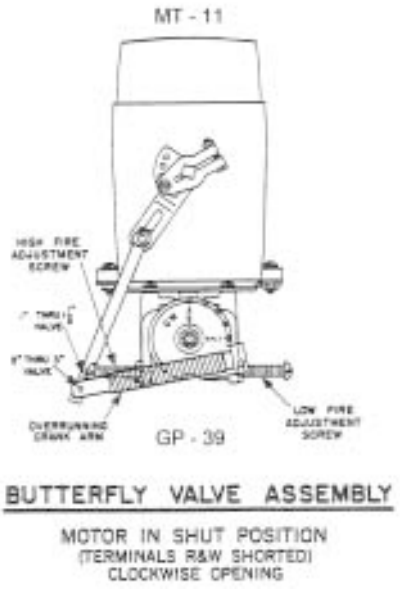
Set low fire with the low fire adjusting screw on the butterfly valve.

CAUTION: Too low of an input setting will cause condensation of the flue gases, this should be avoided unless condensate drains are provided.

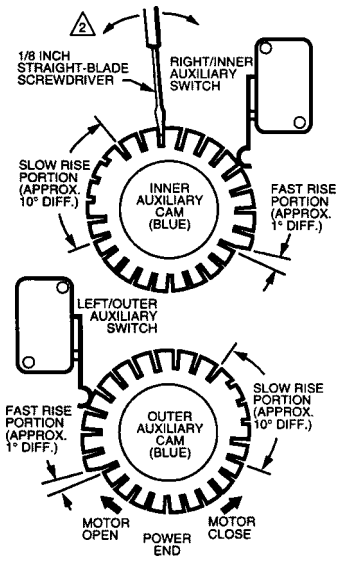
See following drawings for operation of modulating thermostat and typical circuit. SW-13 should cycle the burner.

See final checks and adjustments.

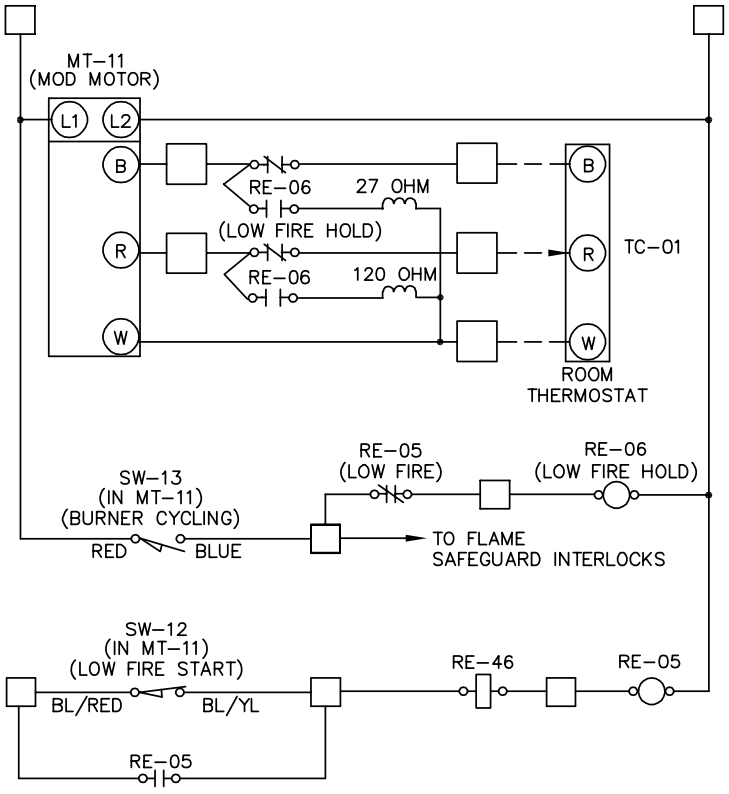
Butterfly Valve Assembly



Adjustment of Cam on Firing Rate Valve SW - 12 & 13



Typical Sequence For Modulating Thermostat



NOTES

1. RESISTORS ARE SIZED TO HOLD MODULATING MOTOR AT APPROXIMATELY 25° OF MOTOR TRAVEL FOR LOW FIRE START.
2. SW–13 (BURNER CYCLING SWITCH) MADE 20° TO 90° OF MOTOR TRAVEL.
3. SW–12 (LOW FIRE START SWITCH) MADE 0° TO 30° OFF MOTOR TRAVEL.

OPERATION

1. STAT CALLS FOR HEAT DRIVING MT–11 OPEN.
2. WHEN MT–11 REACHES 20° OPEN, SW–13 CLOSES.
3. SW–13 POWERS RE–06 AND PLACES MT–11 UNDER RESISTOR CONTROL.
4. MT–11 MOVES TO 25° OPEN AND REMAINS THERE DURING TRIAL FOR IGNITION.
5. UPON PROOF OF FLAME RE–05 DE–ENERGIZES RE–06.
6. MT–11 IS TRANSFERRED BACK TO CONTROL.
7. WHEN MT–11 OPENS TO 30° SW–12 WILL OPEN.
8. RE–05 CONTACTS FORM A BY–PASS CIRCUIT AROUND SW–12.

THE MODULATING MOTOR (MT–11) IS OFF WHEN IT IS THE FULL CLOCKWISE POSITION WHEN VIEWING TOWARD THE END SWITCHES.

C–000562

FINAL CHECKS AND ADJUSTMENTS

With the gas input pressure established, the flue gas analysis can now be preformed. This is checked in the stand off box where the induced draft fan airflow switch tube is located.

The following readings should be taken but not limited to:

CO_2 %	Net Stack Temperature
O_2 %	Combustion Efficiency
CO %	

If necessary, make adjustments on burner air shutter. **DO NOT** change the fuel input rate.

The following list covers general combustion problems and some of the possible cures. Conditions may vary in the field. Refer to combustion chart for efficiency.

CAUTION: Check local codes for maximum allowable percentages and amounts of emissions.

Low Carbon Dioxide (CO_2)

- Fuel input too low
- Excess burner air
- Wrong draft setting

Detectable Carbon Monoxide (CO)

- Fuel input too high
- Not enough burner air
- Restricted draft
- Flame impingement

Excessive Stack Temperature

- Draft setting too high
- Excess burner air
- Fuel input too high

Low Oxygen (O_2)

- Oxygen reading must always be a positive percentage

Cycle burner several times to ensure smooth light off and proper operation. Visually observe the flame pattern. There must be no flame impingement or hot spots on the combustion chamber that could cause scaling.

Check voltage and amperage on all motors.

Check all dampers, linkages, and locking quadrants to make sure they are secure and operating correctly.

SAFETY AND CONTROLS CHECKOUT

Flame Safeguard – Close the last manual gas valve before burner. Operate unit in heat mode. After pilot flame has been established, close manual pilot gas valve. The flame safeguard must trip out within 15 seconds.

Gas Pressure Switches – The low gas pressure switch will trip out and must be reset before resuming operation when the inlet gas shut off valve is turned off, or inlet gas pressure is lower than the trip point. The high gas pressure switch can be checked by reducing the setting of its trip point lower than the burner operating pressure. The switch should trip out and shut off the burner. Return the adjustment to its original setting and reset to resume operation.

Temperature Controls – The temperature controls are checked by adjusting control to a higher temperature to allow burner to cycle on. Adjust control to a lower temperature to allow burner to cycle off. Return the control to its original setting.

Air Pressure Switches – The air pressure switches can be checked by turning the adjusting screw to call for a higher pressure than is normally used on the system. Recycle is automatic when the switch is returned to its original setting. If the burner or draft proving switches open, this could cause the flame safeguard to go into lockout mode.

Limit Controls – The limit controls are checked by adjusting control to a lower temperature setting while the unit is operating on high fire and observe cut-off. Return the control to its original setting. Manual reset may be required on some controls.

Make sure all the safety and controls are working properly.

SECTION VI - UNIT SHUTDOWN

A. **Extended Shutdown**

1. Set the Heat "on-off" switch to the "off" position for 3 minutes, or a sufficient amount of time to allow the heat exchanger to cool down. Then turn the Fan "on-off" switch to the "off" position.
2. Close all the manual gas shut off valves.
3. Open the main electrical disconnect switch.
4. If the unit is to remain idle for an extended period, the fan and motor shafts should be rotated by hand to spread the grease over the bearings.

B. Emergency Shutdown Only —

1. Open the main electrical disconnect switch.
2. Close the main manual gas valve.

SECTION VII - TROUBLE SHOOTING

HONEYWELL RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D 7800 SERIES RELAY MODULES

PRINCIPAL TECHNICAL FEATURES

The RM7895, RM7896 provides all customary flame safeguard functions as well as significant advancements in safety, annunciation, and system diagnostics.

Safety Shutdown (Lockout) Occurs if:

1. INITIATE PERIOD
   a. Purge card is not installed or removed.
   b. Purge card is bad.
   c. Configuration jumpers have been changed (after 200 hours).
   d. AC line power errors occurred, see Operation.
   e. Four minute INITIATE period has been exceeded.
2. STANDBY PERIOD
   a. Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing.
   b. Flame signal is detected after 30 seconds.
   c. Ignition/pilot valve/intermittent pilot valve terminal is energized.
   d. Main valve terminal is energized.
   e. Delayed (2nd stage) main valve terminal is energized (RM7895C,D/EC7895C; RM7896C, D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
3. PREPURGE PERIOD
   a. Airflow lockout feature is enabled and the airflow switch opens.
   b. Ignition/pilot valve terminal is not energized.
   c. No flame present at end of PFEP.
   d. Main valve terminal is energized.
   e. Delayed main valve terminal is energized (RM7895C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
4. PILOT FLAME ESTABLISHING PERIOD (PFEP)
   a. Airflow lockout feature is enabled and the airflow switch does not close after ten seconds or within the specified purge card timing.
   b. Flame signal is detected after 30 seconds.
   c. Ignition/pilot valve/intermittent pilot valve terminal is energized.
   d. Main valve terminal is energized.
   e. Delayed (second stage) main valve terminal is energized (RM7895C,D/EC7895C; RM7896C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.
5. MAIN FLAME ESTABLISHING PERIOD (MFEP) (RM7895C,D/EC7895C; RM7896C,D)
   a. Airflow lockout feature is enabled and the airflow switch opens.
   b. Ignition terminal is energized.
   c. Ignition/pilot valve terminal is not energized.
   d. Main valve terminal is not energized.
   e. Delayed main valve terminal is energized.
   f. No flame present at end of MFEP.
   g. Internal system fault occurred.
   h. Purge card is removed.
   i. Purge card is bad.
6. RUN PERIOD
   a. No flame present.
   b. Airflow lockout feature is enabled and the airflow switch opens.
   c. Interrupted pilot valve terminal is energized (RM7895C,D/EC7895C; RM7896C,D).
   d. Main valve terminal is not energized.
   e. Delayed (second stage) main valve terminal is not energized (RM7895C,D/EC7895C; RM7896C,D).
   f. Internal system fault occurred.
   g. Purge card is removed.
   h. Purge card is bad.

OPERATION

Sequence of Operation

The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D has the operating sequences listed below; see Fig. 2 and 3. The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D LED provide positive visual indication of the program sequence: POWER, PILOT, FLAME, MAIN and ALARM.

Initiate

The RM7895A,B,C,D/EC7895A,B,C; RM7896A,B,C,D Relay Module enters the INITIATE sequence when the relay module is powered. The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D can also enter the INITIATE sequence if the relay module verifies voltage fluctuations of +10/-15% or frequency fluctuations of ±10% during any part of the operating sequence. The INITIATE sequence lasts for ten seconds unless the voltage or frequency tolerances are not met. When not met, a hold condition is initiated and displayed on the optional KDM for at least five seconds; when met, the INITIATE sequence restarts. If the condition is not corrected and the hold condition exists for four minutes, the RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D locks out.

Causes for hold conditions in the INITIATE sequence:
1. AC line dropout detection.
2. AC line noise that can prevent a sufficient reading of the line voltage inputs.
3. Low line voltage brownouts.

The INITIATE sequence also delays the burner motor starter from being energized and de-energized from an intermittent AC line input or control input.

Standby
The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D is ready to start an operating sequence when the operating control input determines a call for heat is present. The burner switch, limits, operating limit control and all microcomputer-monitored circuits must be in the correct state for the relay module to continue into the PREPURGE sequence.

Normal Start-Up Prepurge
The RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D Relay Module provides PREPURGE timing selectable from two seconds to thirty minutes with power applied and the operating control indicating a call for heat.
1. The Airflow Interlock, burner switch, Run/Test switch and all microcomputer-monitored circuits must also be in the correct operating state.
2. The motor output, terminal 4, is powered to start the PREPURGE sequence.
3. The Airflow Interlock input closes ten seconds into PREPURGE or within the specified purge card timing; otherwise, a recycle to the beginning of PREPURGE or lockout occurs, depending on how the Airflow Switch selectable jumper (JR3) is configured.

Ignition Trials
1. Pilot Flame Establishing Period (PFEP):
   a. When the PFEP begins:
      (1) The pilot valve and ignition transformer, terminals 8 and 10, are energized. The RM7895A,B, EC7895A, and RM7896A,B have an intermittent pilot valve, terminal 8. The EC7895C, RM7895C,D, and RM7896C,D have an interrupted pilot valve, terminal 8.
      (2) Flame must be proven by the end of the ten second PFEP (four seconds if Configuration Jumper JR1 is clipped) to allow the sequence to continue. If a flame is not proven by the end of PFEP, a safety shutdown occurs.
   b. With flame proven, the ignition, terminal 10, is de-energized.
2. `Main Flame Establishing Period (MFEP):
   a. After Ignition Trials, and with the presence of flame, the main fuel valve, terminal 9, is powered. If a flameout occurs, the relay module locks out or recycles (depending on status of jumper JR2) within 0.8 or 3 seconds, depending on the Flame Failure Response Time (FFRT) of the amplifier.
   b. The RM7895C,D/EC7895C, and RM7896C,D have a ten second MFEP. After the Ignition Trials and with the presence of flame, the main fuel valve, terminal 9, is powered. If a flameout occurs, the relay module locks out within 0.8 or 3 seconds, depending on the amplifier FFRT.

Run
1. The RM7895C,D, EC7895C, RM7896C,D has a delayed main valve that is energized once the RUN period is entered.
2. The relay module is now in RUN and remains in RUN until the controller input, terminal 6, opens, indicating that the demand is satisfied or a limit has opened.

Post Purge (RM7896A,B,C,D Only)
After demand is satisfied or a limit opens, de-energizing terminal 6, the Ignition/Pilot valve, main valve and delayed main valve, terminals 8, 9 and 21, are de-energized. The blower motor, terminal 4, remains powered for 15 seconds. Run/Test Switch (RM7895C,D/EC7895C; RM7896C,D only)
The Run/Test Switch is located on the top side of the relay module, see Fig. 5. The Run/Test Switch allows the burner sequence to be altered as follows:
1. In the measured PREPURGE sequence, the Run/Test Switch, placed in the TEST position, causes the PREPURGE timing to stop.
2. In the Pilot Flame Establishing Period, the Run/Test Switch, placed in the TEST position, stops the timer during the first eight seconds of a ten-second PFEP selection or during the first three seconds of a four-second PFEP selection. It also allows for pilot turndown test and other burner adjustments. This activates a fifteen-second flameout timer that permits pilot flame adjustment without nuisance safety shutdowns. The Run/Test Switch is ignored during PFEP for the C and D relay modules if terminals 8 and 9 or 9 and 21 are jumpered.

IMPORTANT: When the relay module is switched to the TEST mode, it stops and holds at the next Run/Test Switch point in the operating sequence. Make sure that the Run/Test Switch is in the RUN position before leaving the installation.

SETTINGS AND ADJUSTMENTS

Selectable Site-Configurable Jumpers

The relay module has three site-configurable jumper options, see Fig. 6 and Table 7. If necessary, clip the site-configurable jumpers with side cutters and remove the resistors from the relay module.

SERVICE NOTE: Clipping and removing a site-configurable jumper enhances the level of safety.

Figure 5 - Sequence Status LEDs

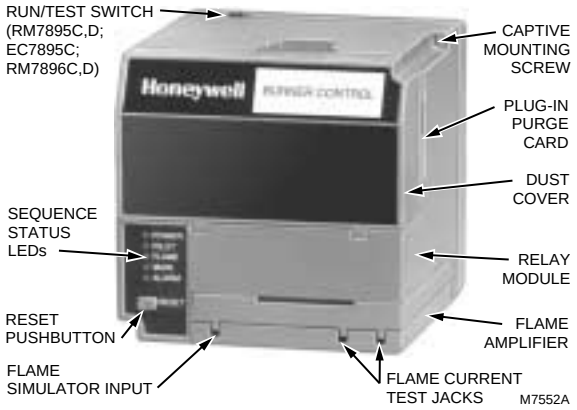


Figure 6 - Selectable Site-Configurable Jumpers

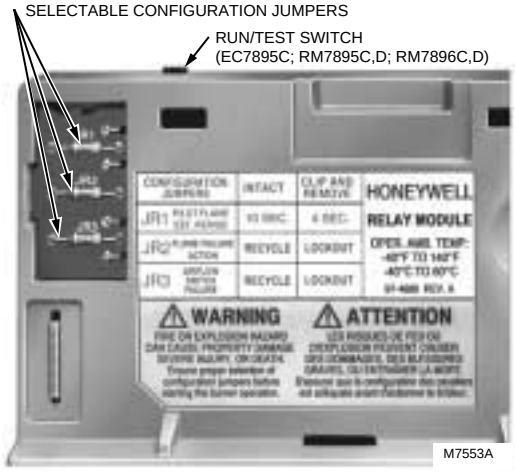


Table 7 - Site-Configurable Jumper Options

Jumper Number	Description	Intact	Clipped
JR1*	Pilot Flame Establishing Period (PFEP)	10 Seconds	4 Seconds
JR2	Flame Failure Action	Recycle	Lockout
JR3	Airflow Switch (ILK) Failure	Recycle	Lockout

IMPORTANT: Clipping and removing a jumper after 200 hours of operation causes a nonresettable Fault 110. The relay module must then be replaced.

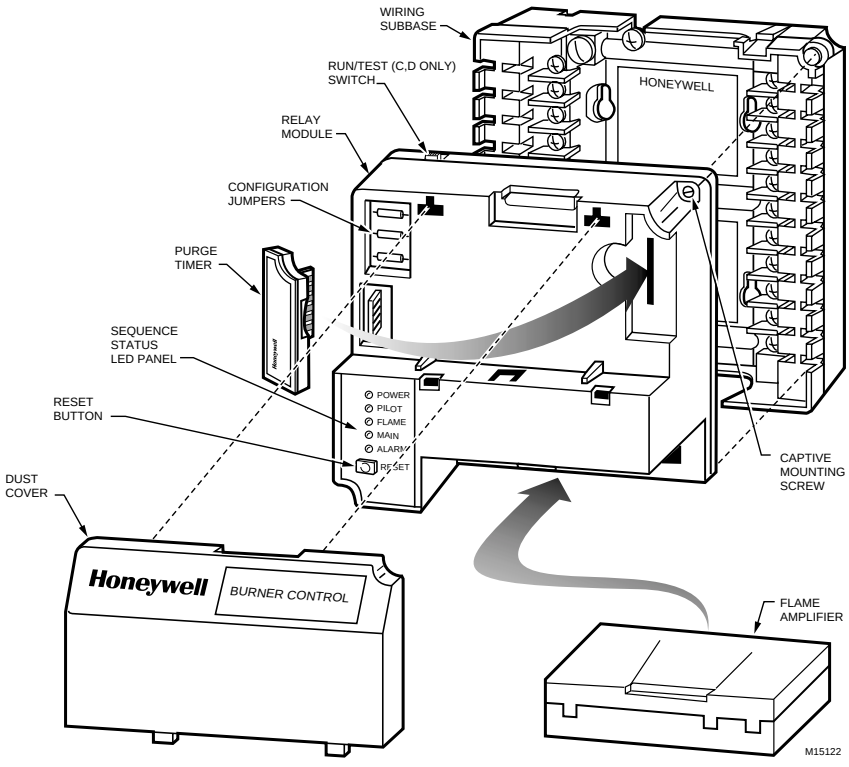
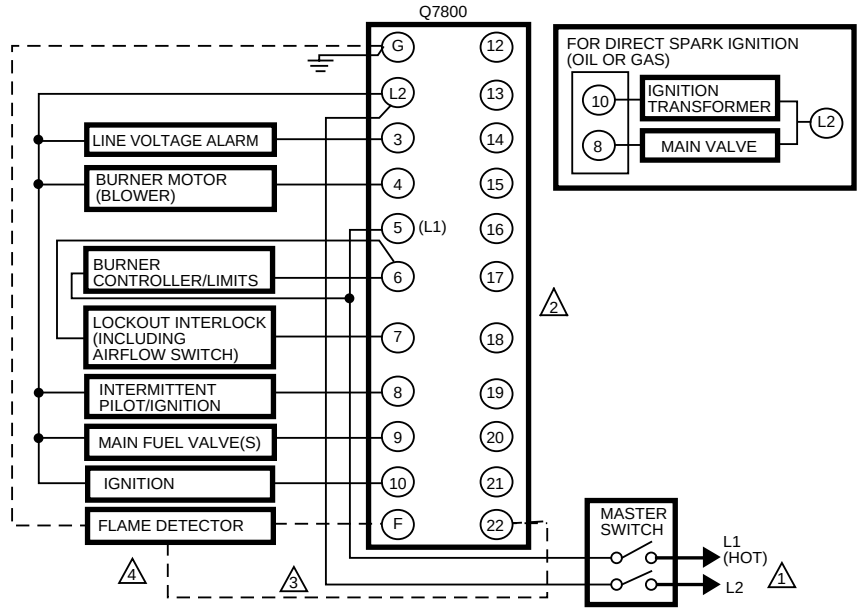
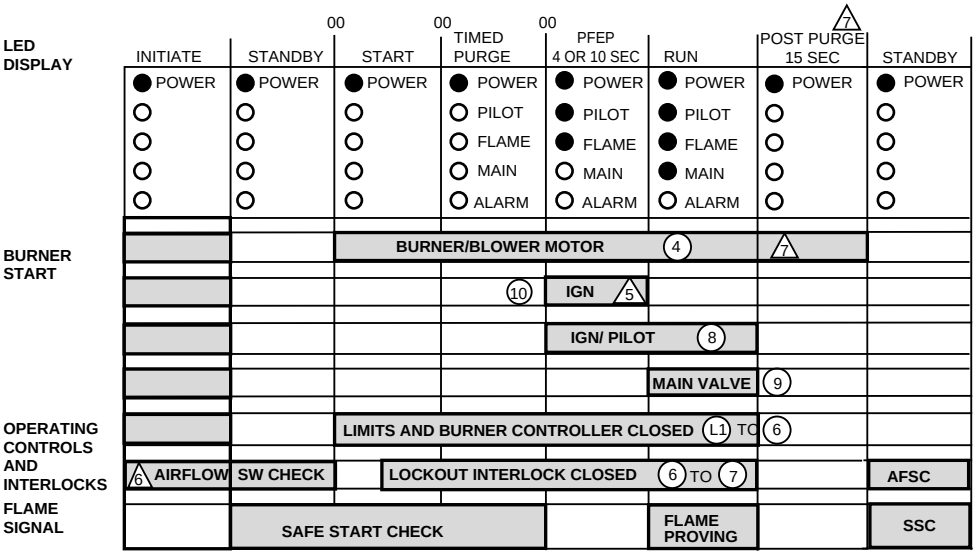


Figure 4 - RM7895A,B,C,D/EC7895A,C; RM7896A,B,C,D Relay Module Exploded View

Figure 2 - Wiring Subbase and Sequence Chart for RM7895A,B/EC7895A; RM7896A,B





1 RM7895, RM7896: 120 VAC , 50/60 HZ; EC7895: 220-240 VAC, 50/60 HZ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 DO NOT CONNECT ANY WIRES TO UNUSED TERMINALS.

3 FOR EC7895, A 220 TO 240 VAC TO 120 VAC, 10 VA MINIMUM STEPDOWN TRANSFORMER (NOT PROVIDED) MUST BE USED TO DRIVE THE SHUTTER.

4 SEE FLAME DETECTOR SPECIFICATIONS FOR CORRECT WIRING.

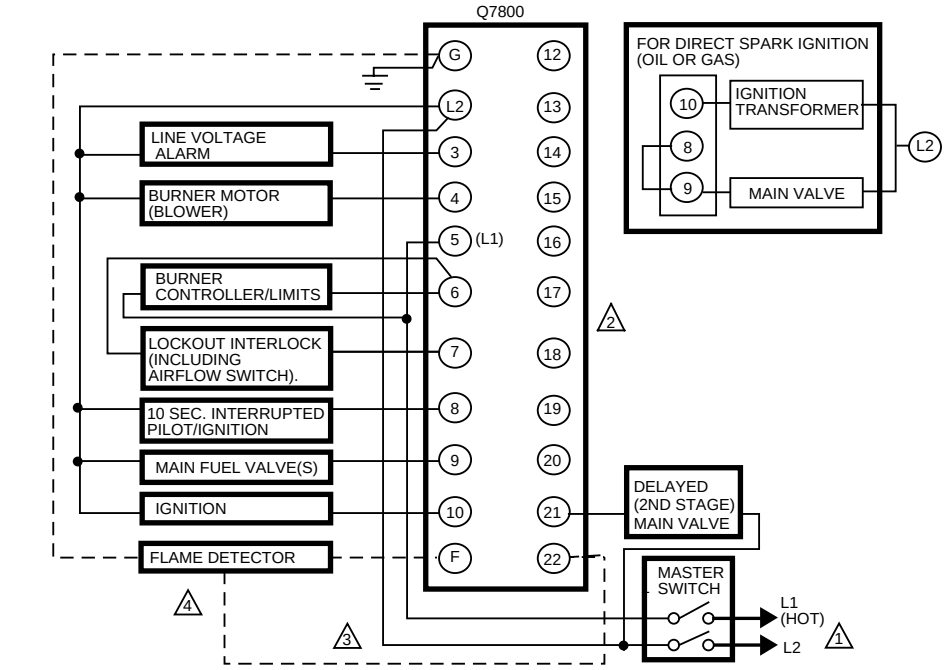
5 FOR RM7895A1048 (ONLY), IGNITION TERMINAL 10 IS DE-ENERGIZED WHEN FLAME IS PROVEN.

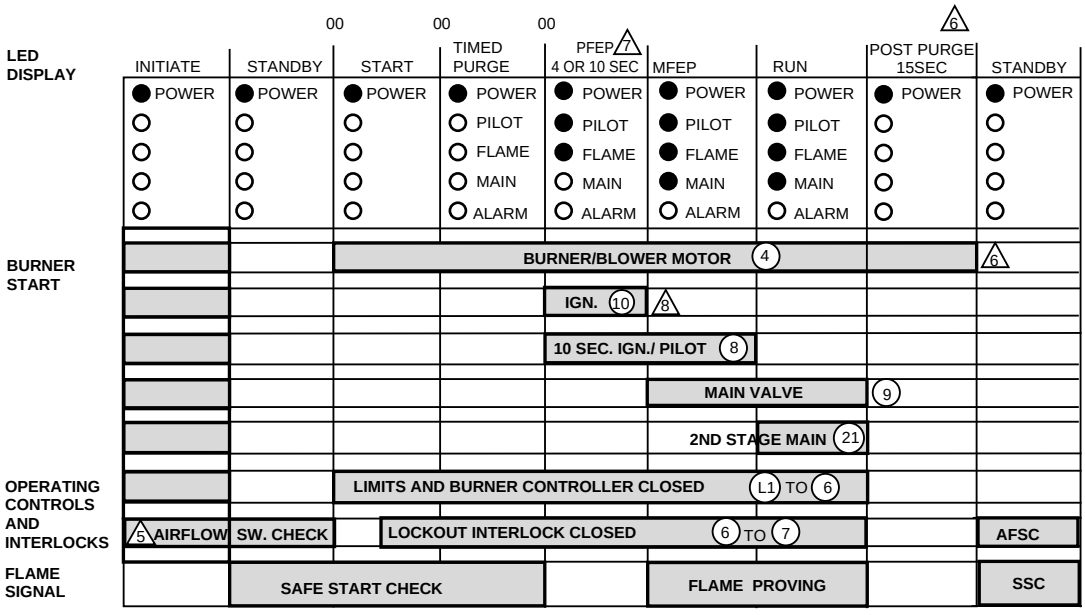
6 AIRFLOW SWITCH CHECK FEATURE IS FOR THE RM7895B,RM7896B.

7 RM7896A,B ONLY.

M15123A

Figure 3 - Wiring Subbase and Sequence Chart for RM7895C,D/EC7895C,D; RM7896C,D





1 RM7895, RM7896: 120 VAC , 50/60 HZ; EC7895: 220-240 VAC, 50/60 HZ POWER SUPPLY. PROVIDE DISCONNECT MEANS AND OVERLOAD PROTECTION AS REQUIRED.

2 DO NOT CONNECT ANY WIRES TO UNUSED TERMINALS.

3 FOR EC7895, A 220 TO 240 VAC TO 120 VAC, 10 VA MINIMUM STEPDOWN TRANSFORMER (NOT PROVIDED) MUST BE USED TO DRIVE THE SHUTTER.

4 SEE FLAME DETECTOR SPECIFICATIONS FOR CORRECT WIRING.

5 AIRFLOW SWITCH CHECK FEATURE IS FOR THE RM7895D, RM7896D.

6 RM7896C,D ONLY.

7 RM7895C1020, RM7896C1036 PFEP 10 SECONDS ONLY.

8 RM7895C1020, RM7896C1036: DURING FIRST 8 SECONDS OF PFEP, WHEN A FLAME SIGNAL IS DETECTED, TERMINAL 10 IS DE-ENERGIZED. IF FLAME SIGNAL IS LOST, TERMINAL 10 WILL RE-ENERGIZE.

M15124GR

SECTION VII - TROUBLESHOOTING

Symptom	Cause	Remedy
A. Blower does not operate.	1. Low or no voltage. 2. Fuse(s) blown. 3. Customer's interlock not closed or connected. 4. Fan "on-off" switch in "off" position. 5. Door switch open. 6. Freeze protection tripped. 7. Damper motor not operating, its end switch not making, or dampers binding. 8. Overload protection on motor starter tripped. 9. Belts loose or broken. 10. Motor may be burned or incorrectly wired. 11. Time clock or field installed controls not closed. 12. Night set back thermostat not closed. 13. Bearing seized on shaft.	1. Check power source. 2. Replace fuse(s). 3. Close or connect customer interlock. 4. Switch to "on" position. 5. Close door. 6. Check stat and settings, reset by re-cycling the power. Check sensor and location. 7. Check for power at damper motor and that end switch has been wired correctly. End switch should be wired N.O. (normally open). Clear linkage. 8. Reset the starter by pushing red button on starter, check amp draw. 9. Turn power off and check belts. 10. Turn power off and check motor and wiring. 11. Check time clock and field installed controls for correct settings and voltage. 12. Check night set back thermostat for correct settings. 13. Turn power off and check bearings.

SECTION VII - TROUBLESHOOTING *continued*

Symptom	Cause	Remedy
B. No voltage at flame safeguard relay input terminals.	1. Fan and Heat "off-on" switch in "off" position. 2. SW-13 in MT-11 (if applicable) not closed. 3. Auxiliary switch on starter not closed. 4. Proof of closure switch open (if applicable). 5. Thermostat open. 6. High temperature limit is open. 7. High-Low gas pressure switches open. 8. Outside air temperature higher than on-off inlet ductstat setting. 9. Time clock or field installed controls open.	1. Place switch in "on" position. 2. Check modulating motor for proper operation (see sheet in manual). 3. Check auxiliary circuit wiring and contacts. 4. Check and see if gas valve is closed, check wiring on circuit. 5. Check thermostat for proper setting. 6. Check limit for proper settings. 7. Correct gas pressure and reset switches. 8. Check ductstat for proper setting. 9. Check time clock and field controls for correct settings and voltage.
C. Flame safeguard relay goes into safety shutdown (Lockout).	1. See technical data sheets on flame safeguard relay.	1. Determine the cause of lockout. Push reset button on flame safeguard relay.
D. Pilot does not light after pre-purge has timed out and voltage is present on flame safeguard output terminals.	1. Manual pilot shut-off valve closed. 2. Inlet gas pressure lower than minimum gas pressure required. 3. No gas through pilot regulator with sufficient inlet gas pressure. 4. No gas flow through pilot solenoid valve. 5. Type of gas supplied (natural gas or propane) different than shown on unit rating plate. 6. Flame detection system not sensing pilot flame. (See section for servicing burner). 7. No voltage on secondary side of ignition transformer.	1. Slowly open valve. 2. Increase gas pressure. 3. Clear obstruction in vent orifice or line, replace if defective. 4. Check for proper installation, and voltage. Correct or replace if defective. 5. Connect to proper fuel supply of contact factory for field conversion parts. 6a. U.V. Sensor – Clean lens, check wiring and spark rod. 6b. Flame Rod - Assure rod is in pilot flame, check wiring, and flame rod. 7. Check wiring. Replace transformer if defective.

SECTION VII - TROUBLESHOOTING *continued*

Symptom	Cause	Remedy
E. If pilot does not light after pre-purge has timed out and there is no voltage at flame safeguard relay output terminals.	1. Flame safeguard relay run/test switch in test position or is defective. 2. Burner or draft motor not running 3. Burner or draft air proving switch is open.	1. Place switch in run position, see technical cut sheet on flame safeguard relay, or replace if defective. 2. Check wiring, fuses, and amp draw on motors. 3. Check for correct rotation and or adjust switch.
F. If there is no heat with pilot on and voltage is present at flame safeguard relay output terminals.	1. Manual gas shut-off valve closed. 2. No gas on outlet side of regulator with proper inlet pressure. 3. No gas on outlet side of valve or actuator with proper inlet pressure. 4. Low fire start switch, SW-12 in MT-11 is open (if applicable). 5. Inlet gas pressure lower than the required gas pressure. 6. Normally open vent valve (if applicable) not closing. 7. Gas nozzles obstructed or plugged.	1. Turn Heat "off-on" switch to the "off" position. Slowly open all manual gas shut-off valves. 2. Clear obstruction in vent orifice or line. Check for correct size spring. Replace if defective. 3. Check wiring, voltage, and adjustment. Correct wiring or replace if defective. 4. Check for proper operation, see sheet in manual for proper settings. 5. Increase gas pressure. 6. Check for correct installation and voltage. Correct or replace. 7. Clear obstruction or blockage.
G. If there is no heat with pilot on and no voltage is present at flame safeguard relay output terminals.	1. Flame safeguard relay run/test switch in test position or is defective.	1. Place switch in run position, see technical cut sheet on flame safeguard relay, or replace if defective.

SECTION VIII - SERVICING THE BURNER

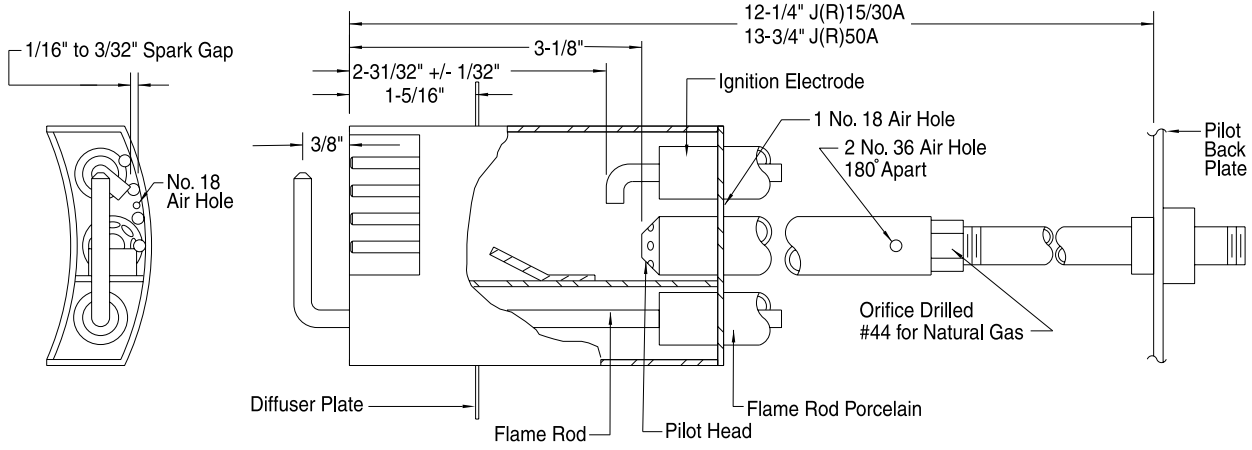
This section is intended as a guide in making some repairs and adjustments to the power burner. Many of the repairs will require the service of a skilled heating service technician. For more information refer to the burner I.O.M.

Power Flame Burners

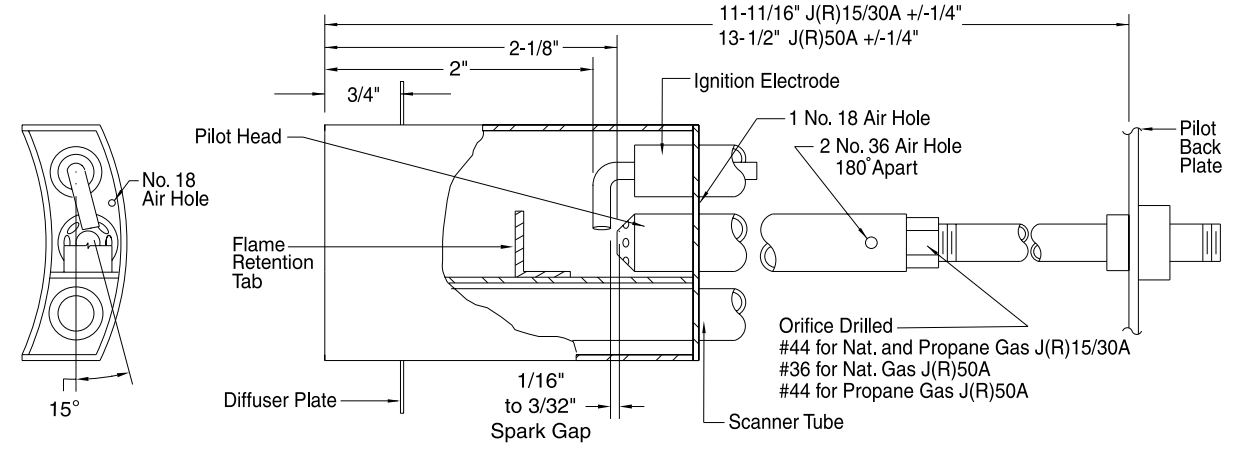
1) GAS-ELECTRIC IGNITION
   The gas-electric pilots used on Power Flame burners are either flame rod or scanner design.
2) POOR FLAME SIGNAL
   Try adjusting needle valve or pilot pressure regulator. Should this not be successful, check the primary pilot air. If neither of these methods improve the reading, inspect the flame rod position.

   The spark is to arc against the outside radius of the pilot assembly case (not the pilot head nozzle). The normal spark gap should be 1/16" – 3/32". See the drawings for pilot assembly for the J-Burner.

Pilot Assembly–J-Burner with Flame Rod - Natural Gas Only

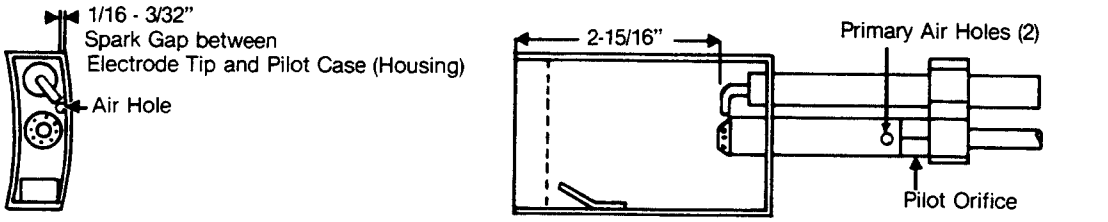


Pilot Assembly–J-Burner with Scanner - Natural or LP Gas

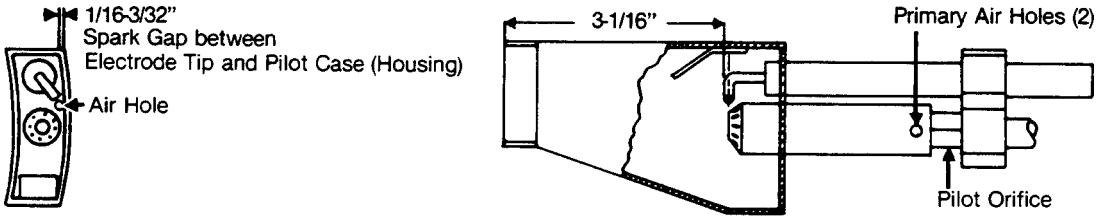


The arc from the electrode tip should jump from tip to the body of the pilot housing and should be lined up with the hole in the backside of pilot housing, so that the blower air passing through this hole will cause the arc to “FLAG” (or move around). Normal spark gap should be 1/16" – 3/32". The electrode should not be moved so far forward that the pilot flame will impinge on the porcelain insulator. This may cause damage to the porcelain. See the drawings for the pilot assembly for the C-Burner

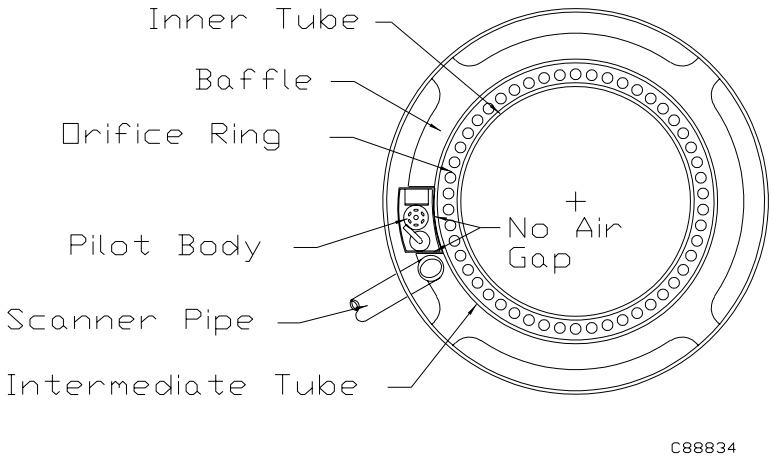
Pilot Assembly–C-Burner For C1 & C2 Burner



Pilot Assembly–C-Burner For C3, C4, & C5 Burner



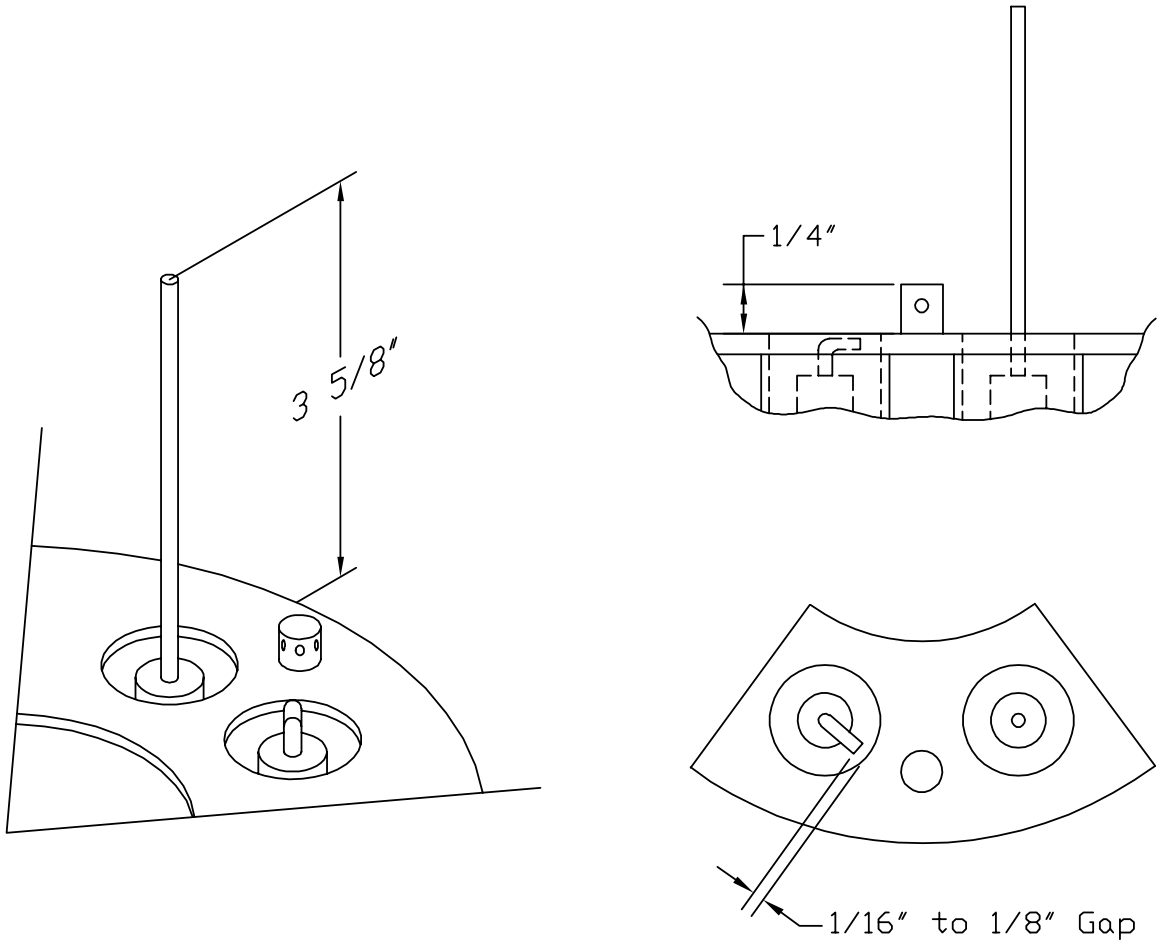
Pilot Case to Gas Manifold Adjustment



G-P Burners

1) GAS-ELECTRIC IGNITION
   The gas-electric pilots used on G-P burners are either flame rod or scanner design.
2) POOR FLAME SIGNAL
   Try adjusting needle valve or pilot pressure regulator. Should this not be successful, check the primary pilot air. If neither of these methods improve the reading, inspect the flame rod position.

Ignition Electrode For Straight G-P Gas Burners Using A Flat Diffuser Plate

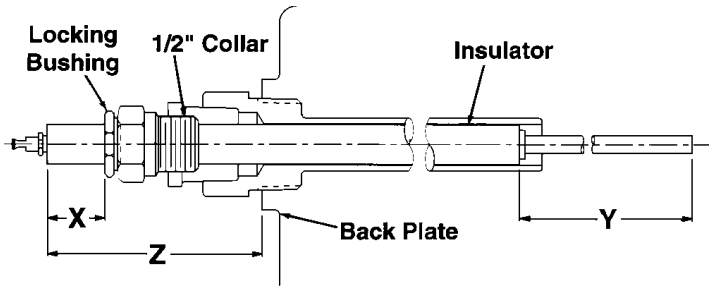


3) IGNITION ELECTRODE
   The ignition electrode is positioned as shown, with the horizontal part of the electrode flush with the diffuser plate. Leaving a gap of 1/16” to 1/8” wide. The pointing direction of the electrode is as shown, but is not critical.
4) FLAME SENSOR
   a. The flame sensor shown is a rectification, or flame rod. A UV scanner can be used instead. In that case the scanner tube is positioned in the same holder as the flame rod.

MAXON MODEL (400) OVENPAK Burners

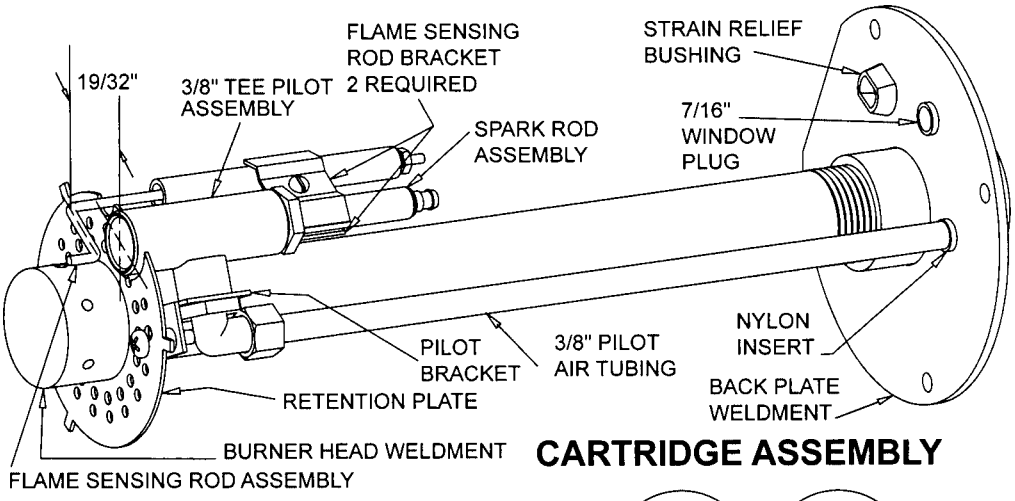
1) GAS-ELECTRIC IGNITION
   The gas-electric pilots used on MAXON burners are either flame rod or scanner design.
2) POOR FLAME SIGNAL
   Try adjusting needle valve or pilot pressure regulator. Should this not be successful, check the primary pilot air. If neither of these methods improve the reading, inspect the flame rod position.

MAXON Electrode & Flame Rod



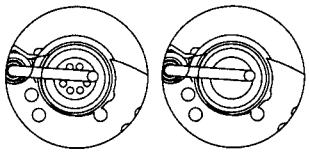
Burner Model	Spark Ignitor Dimensions		Flame Rod Dimensions		
	X	Y	X	Y	Z
405 407M 408M 408 412M 413M	1.3	.4	.4	6	2.9
415 422M	1.5	.4			
425 432M 435 442M	1.2	.4	.8	10.8	3.5
445 456M 470M 487M	1.3	.4	.4	12.8	2.9

Midco "RE4400" & "RE4400B" Series

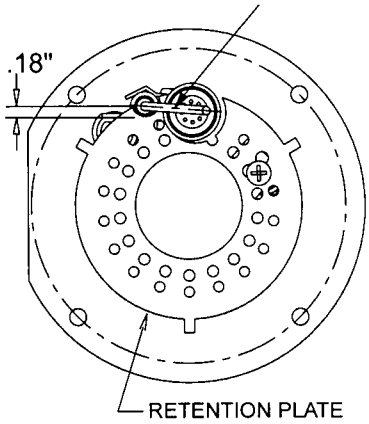


CARTRIDGE ASSEMBLY

NOTE:
MAKE SURE THAT THE FLAME SENSING ROD CENTER-LINE COINCIDES WITH THE 1/2" RETENTION PLATE CENTER-LINE.

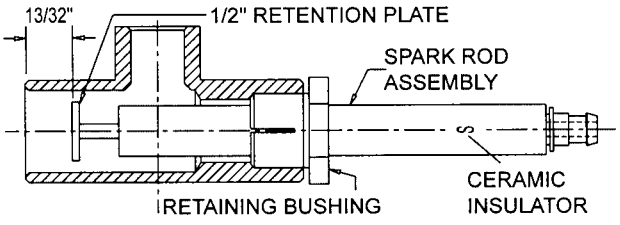


3/8" TEE PILOT DETAIL



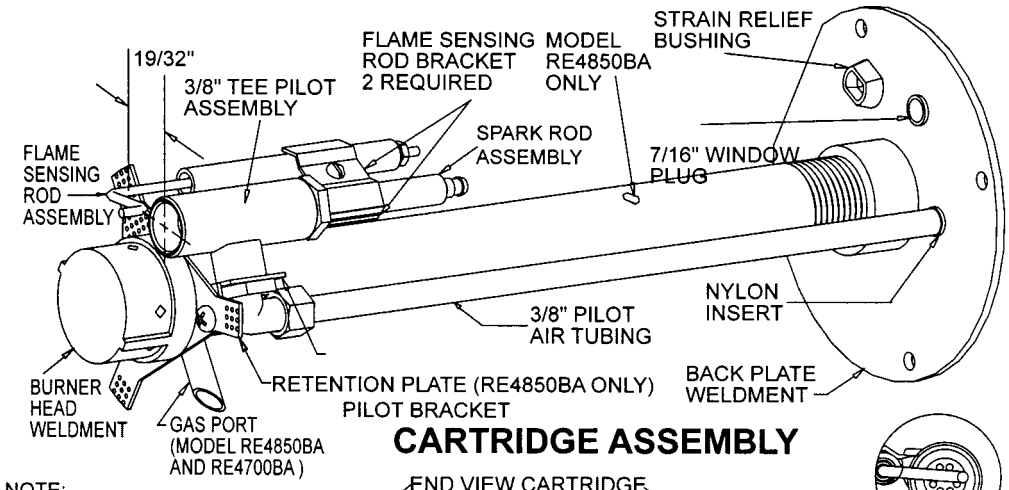
END VIEW OF CARTRIDGE

*NOTE:
SPARK ROD SHOULD BE CENTERED IN THE TEE & HELD SECURELY BY THE RETAINING BUSHING. OVER TIGHTENING OF THE RETAINING BUSHING MAY CRACK THE CERAMIC INSULATOR.



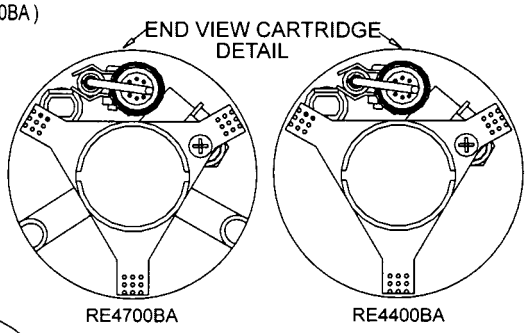
3/8" TEE PILOT ASSEMBLY *
(PARTIAL CUT-A-WAY VIEW)

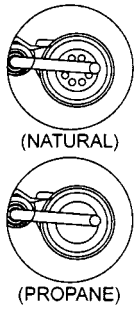
Midco "RE4850A" & "RE4850BA" Series



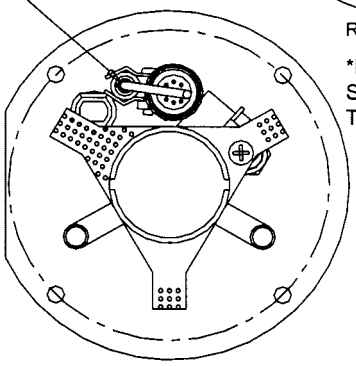
CARTRIDGE ASSEMBLY

NOTE:
MAKE SURE THAT THE FLAME ROD CENTER-LINE COINCIDES WITH THE 1/2" RETENTION PLATE CENTER-LINE.
VERIFY THAT THE FLAME ROD RECESSED INSULATOR TOUCHES THE RETENTION PLATE.



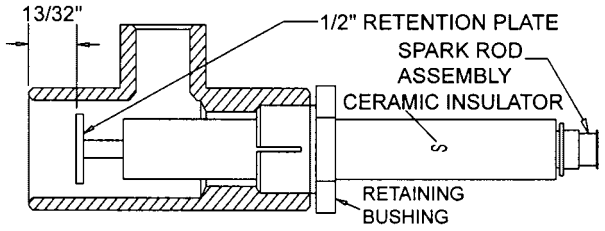


3/8" TEE PILOT DETAIL



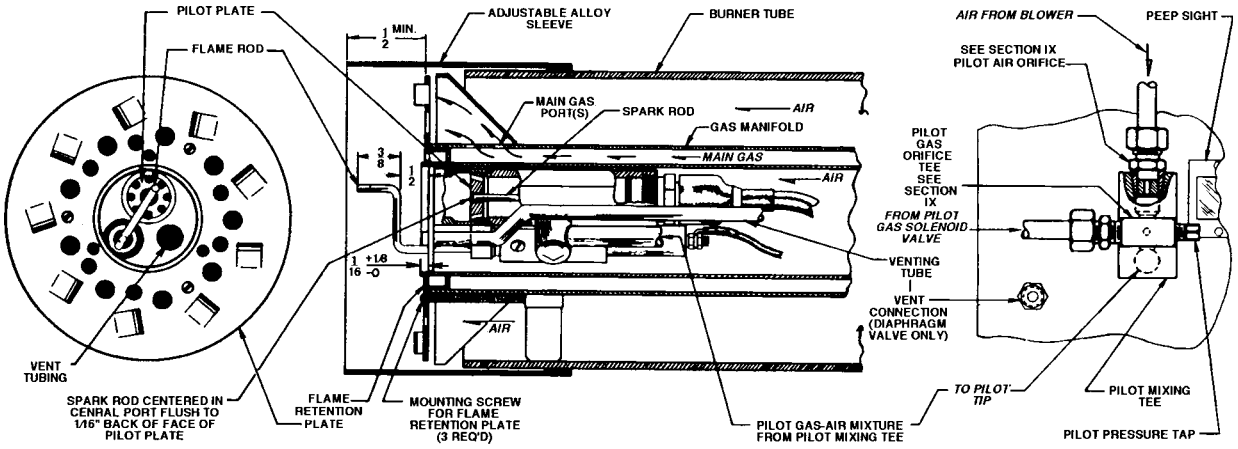
RE4850 MODEL
END VIEW CARTRIDGE

*NOTE: SPARK ROD SHOULD BE CENTERED IN THE TEE & HELD SECURELY BY THE RETAINING BUSHING. OVER TIGHTENING OF THE RETAINING BUSHING MAY CRACK THE CERAMIC INSULATOR.

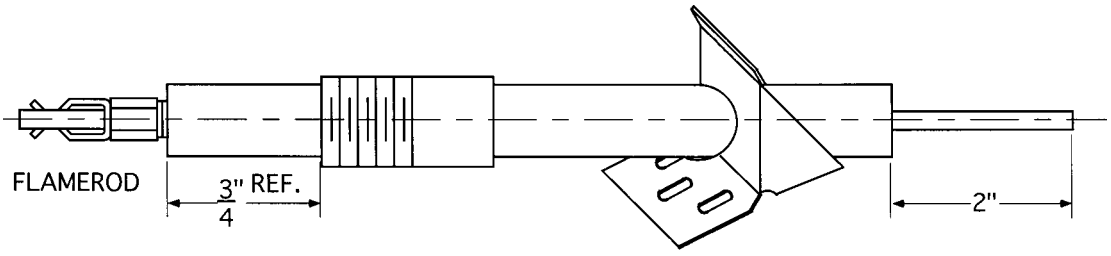


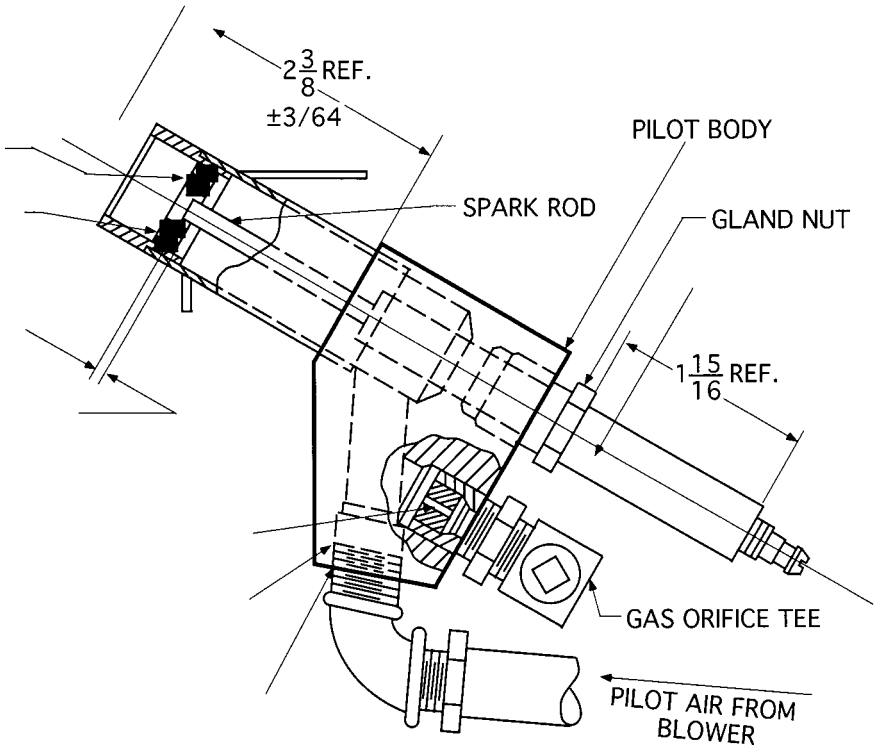
3/8" TEE PILOT ASSEMBLY *
(PARTIAL CUT-A-WAY VIEW)

Midco "G" Series

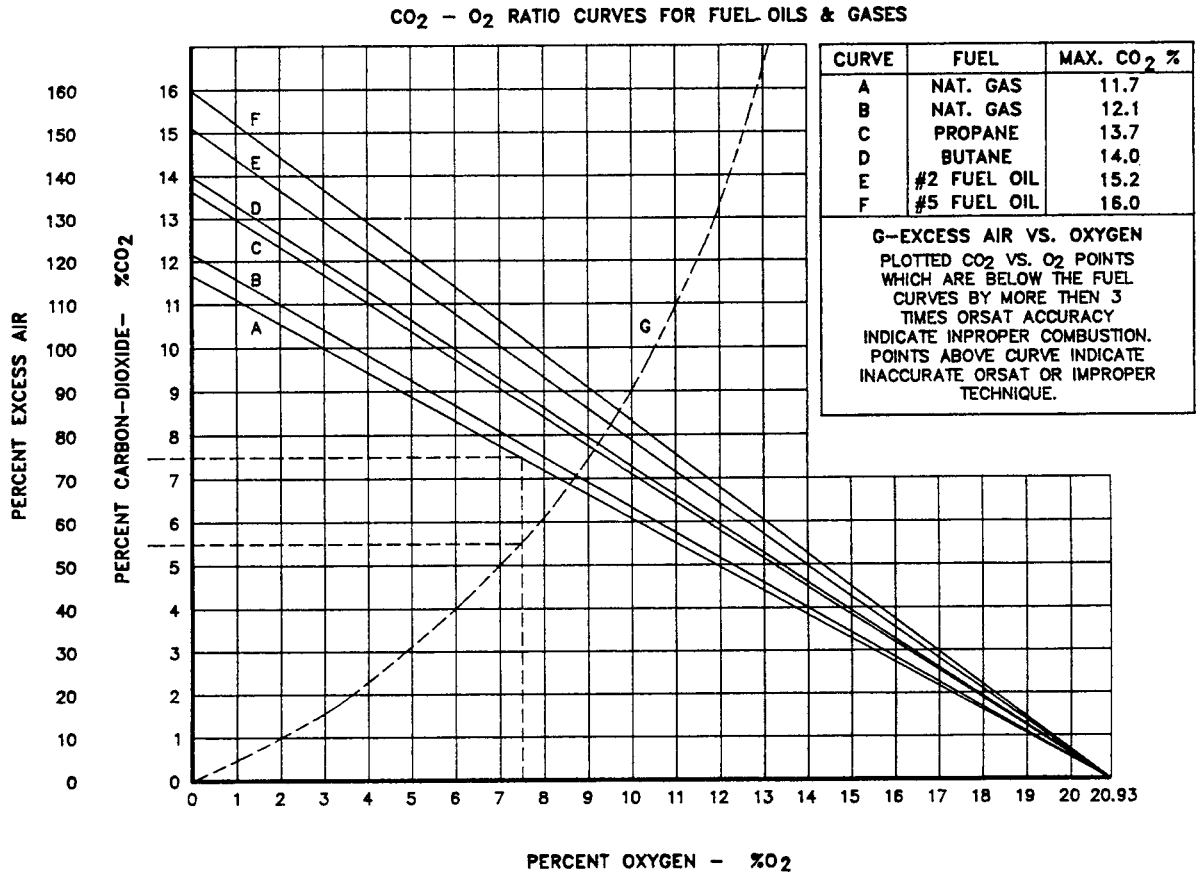


Midco "A" Series





FLUE GAS ANALYSIS


CO_2 – O_2 RATIO CURVES FOR FUEL OILS & GASES
PERCENT EXCESS AIR
PERCENT CARBON-DIOXIDE – $\%CO_2$
PERCENT OXYGEN – $\%O_2$
F
E
D
C
B
A
G
G–EXCESS AIR VS. OXYGEN
PLOTTED CO_2 VS. O_2 POINTS WHICH ARE BELOW THE FUEL CURVES BY MORE THEN 3 TIMES ORSAT ACCURACY INDICATE INPROPER COMBUSTION. POINTS ABOVE CURVE INDICATE INACCURATE ORSAT OR IMPROPER TECHNIQUE.

CURVE	FUEL	MAX. CO_2 %
A	NAT. GAS	11.7
B	NAT. GAS	12.1
C	PROPANE	13.7
D	BUTANE	14.0
E	#2 FUEL OIL	15.2
F	#5 FUEL OIL	16.0

SECTION IX - MAINTENANCE

Periodic maintenance is essential to the efficient operation and extended service life of this equipment. Failure to provide maintenance as recommended may void the equipment warranty.

A. Maintenance Schedule

1. Daily
   a. Check gages, monitors, instruments and equipment settings.
2. Weekly
   a. Check that fan belts are tight and sheaves are aligned. **CAUTION: Do Not Over Tighten Belts.** The fan belts can be checked every 30 days after the first 60 days of new belt run-in.
   b. Check gas pressure at regulator.
3. Monthly
   a. Check all valves, piping and connections for leaks.
   b. Check the pilot and burner flame signal.
   c. Check the fuel pressure in the fuel supply line to each heater.
   d. Check the burner manifold pressure and draft.
   e. Do a flue gas analysis.
   f. Inspect filters. Clean or replace as necessary.
   g. Inspect main fan bearings; lubricate if necessary. See following section on bearing lubrication.
   h. Check all dampers, damper actuators and linkages. Adjust and tighten if necessary.
   i. Inspect area and make sure that no combustible or hazardous material has been stored within clearances as shown on the specification plate.
   j. Check for any vibration or unusual noise. If any is observed, locate the cause and correct.
   k. Ensure the supply, discharge, combustion air, vents, and stack remains clean and open.
4. Quarterly
   a. Complete the monthly maintenance schedule.
   b. Inspect all drives for proper belt tension, wear, and alignment.
   c. Check that bearings, fans, and drives set-screws are securely locked to the shaft.
   d. Inspect the burner and pilot assembly. Clean and adjust if necessary.
   e. Check the voltage and amps on all motors.
   f. Check the operation of all safety limits and controls. Clean and recalibrate or replace.
   g. Check the operation of the automatic gas shut off valves, and check them for leakage at the pressure test ports provided.
   h. Inspect all electrical components, connections, and terminals. Clean or replace and tighten as necessary.
5. Off Season or Yearly
   a. Complete the monthly and quarterly maintenance schedules.
   b. Inspect, and if necessary, clean all fan wheels and housings.
   c. Check that all fan wheels, or props, and sheaves are securely set to the shaft.
   d. Inspect all bearings and check condition and alignment.
   e. Check the condensation lines for any leaks or blockages (if applicable).
   f. Test ignition spark. Adjust gap if necessary.
   g. Clean flame sensor, ignition electrodes, and check for cracks.
   h. Test the flame safeguard relay (RE-02) and replace components if necessary.
   i. Inspect all regulators, relief valves, motorized valves, solenoid valves, vent valves, manual shut off valves, and safety shut off valves. Check their operation and clean as necessary.
   j. Inspect and clean all drip legs in fuel lines and in the flue.
   k. Remove the rear panel and the rear header box cover. Inspect the header box and tubes. Look for carbon deposits, soot, scale or rust. Clean if necessary.
   l. Inspect the combustion chamber for carbon deposits, soot, scale or flame impingement. Clean if necessary. If there is evidence of flame impingement, complete burner adjustment must be made.
   m. Lubricate fan motors as directed by motor manufacturer. Inspect motors for loose connections.
   n. Lightly oil all door latches.
   o. Check that the cabinet is weather-tight. Replace door gaskets and re-caulk as needed.

B. Lubrication Instructions

Motor	Manufacturer	Bearing Type
All 3 phase fan motors (1 HP to 100 HP) ODP, TEFC	U.S., Baldor or equal	Single row ball bearings
Recommendation: See following note.		
All 1 phase motors (Fractional HP) ODP, TEFC or TEAO	Century, G.E., or equal	Bronze sleeve bearings
Recommendation: See following note.		

Fractional HP single phase, ODP or TEFC	Century, G.E., or equal	Bronze sleeve bearings

Recommendation: See following note.

Fan shaft bearings	Browning or equal	Self-aligning single row or double row roller or ball bearings, resilient mounted

Recommendation: See following note.

Dampers	Mestex or equal	Sleeve

Recommendation: See following note.

1. Blower Motors – Some motors require lubrication while others do not. Those that require lubrication can be identified by the presence of grease plugs in the motor casing at each end. Motors that do not have grease plugs cannot be greased and are lubricated for the life of the motor bearing.

   Lubrication of motors should be done while the motor is warm and at a standstill. Remove and clean all grease plugs and insert a grease fitting in the upper hole in the motor casing at each end. (Viewed as if motor were sitting horizontally on its base). There may be one or two plugs in each end casing of the motor. Add a small amount of a clean, good grade ball bearing grease, such as Chevron SR1 #2 or Exxon Polyrex EM with a low pressure grease gun. Run the motor five minutes before removing the grease fittings and replacing the plugs.

   CAUTION: An excess of grease will overheat the bearings.

   NOTE: On totally enclosed fan cooled (TEFC) motors, the rear end fan housing must be removed to expose the grease plugs.

2. Pillow Block Bearings – Pillow block bearings are used on supply blowers or propellers. These bearings have been prelubricated with a number 2 lithium base grease. Lubrication should be done with a similar grease using a low pressure grease gun. Wipe all grease fittings clean before adding grease. Grease should be added slowly, in small amounts at frequent intervals while the shaft is being manually rotated.

   A slight showing of grease at the seals with accompanying normal bearing temperature indicates proper lubrication. Normal temperature can range from “cool” to “hot to the touch” depending on size, speed and surrounding conditions. Excessive bearing temperature indicates faulty lubrication. An insufficient amount of grease is suggested by a bearing showing no grease at the seals, and a higher than normal temperature and noise level. Excessive leakage of grease at the seals, and a high operating temperature suggest too much grease.

   Frequency of Lubrication – Frequency of lubrication depends upon operating conditions. The bearing operating temperature is the best index for determining a lubrication schedule. The following chart gives the frequency of lubrication based upon continuous operation for various operating temperatures and can be used as a satisfactory guide for determining when all ball and roller bearings should be lubricated.

Speed	Temperature	Cleanliness	Interval
100 RPM	Up to 125°F	Clean	6 Months
500 RPM	Up to 150°F	Clean	2 Months
1000 RPM	Up to 210°F	Clean	2 Weeks
1500 RPM	Over 150°F	Clean	Weekly
Any Speed	Up to 150°F	Dirty	1 Week To 1 Month
Any Speed	Over 150°F	Dirty	Daily to 1 week
Any Speed	Any Temp	Very Dirty	Daily to 1 week
Any Speed	Any Temp	Extreme Conditions	Daily to 1 week

3. Dampers – Dampers should be inspected as necessary for securely fastened linkages, and smooth operation. If dampers are binding or excessively noisy, then lubrication may be required. Place one drop of #20 wt. machine oil on each blade bearing, and linkage ball joint. Do not over lubricate, and wipe any excess from the area. Be sure to note that dampers over 49 inches long have intermediate bearings which require lubrication.

C. Air Filters

All filter banks should be equipped with a manometer or differential pressure switch to indicate when the filters are dirty. Filters should be replaced when the differential pressure across them reaches the manufacturer’s recommended final value. Dirty filter elements should be replaced with a clean element of the same type and size. In addition, the manufacturer not only suggests, but insists, that air filters be **checked every 30 days** and replaced with new filters (throwaway type) or cleaned (washable type) as required. Cleanable filters should be given a new application of filter coating after washing to maintain optimum filter performance.

The frequency of cleaning and replacing air filters applies twelve months of the year, **where blowers are used for ventilation and heating.**

D. Belt Tensions and Adjustments

Belt tension is adjusted during the initial run-in and test periods at the factory. However, the belts are run as slack as possible to prevent excessive damage to the bearings, yet tight enough to prevent slippage.

It is necessary, therefore, to tighten all belts during the first few months of operation, and to **check for proper tension weekly during the first 60 days**, after which 30-day check intervals are sufficient.

NOTE: Turn off all power to the equipment before checking belt tensions.

CAUTION: Do not attempt to tighten any belt or belts by changing the pitch of an adjustable pulley, as this will change the speed of a driven pulley, causing the unit to be rendered OUT OF AIR BALANCE. Do Not over tighten belts.

Suggested Belt Tension Method

1. Check tension frequently during the first 24-48 hours of run-in operation. Ideal tension is the lowest tension at which the belt will not slip under peak load conditions. Over tensioning shortens belt and bearing life.

2. To properly tension a conventional V-belt drive use the following procedure:
   a. Measure the span length.
   b. At the center of the span, apply a force perpendicular to the span to deflect the belt 1/64 inch for every inch of span length. For example, for a 40 inch span, apply a force that will deflect the belt 40/64 or 5/8 of an inch.
   c. Compare the force you have applied with the values given in the following table. If the force is between the values for normal tension and 1-1/2 times normal tension, the belt tension should be satisfactory. If the belt tension is not within this range, it can be adjusted by loosening the motor mounting bolts, and adjusting the position of the motor on its base.

NOTE: A new drive can be tightened to two times the minimum value shown to allow for normal drop in tension during the run-in period.

B Section small pulley diameter range in inches	Belt Manufacturer & Type Belt	Pounds Force for Normal Tension	Pounds Force for 1 1/2 times Normal Tension
3.4 – 4.2	Gates Hi-Power	4.4	6.6
4.4 – 4.6	Gates Hi-Power	4.9	7.4
5.8 – 8.6	Gates Hi-Power	5.8	8.7

Note: For recommendation of other types of belts, consult respective manufacturers.

E. Optional Coils and Related Items

1. Coils – Coil surfaces must be kept clean of dirt and lint in order to operate at rated efficiency. Coils should be inspected on a regular basis and cleaned as required.

CAUTION: Solutions used to clean coils must not be corrosive to metals or materials used in the manufacturer of this equipment. If cleaning solutions are applied through means of high pressure spray, care must be taken to avoid damaging coil fins.

2. Condensate Drain Pan – Periodically flush the condensate pan and drain system.

F. Gaskets

Gaskets are used on doors, inspection covers, some filter racks, and some outdoor air dampers. Inspect gaskets periodically and repair or replace as required.

G. Support Means

Inspect the entire unit support means to be sure everything is firmly in place.

SECTION X - REPLACEMENT PARTS

Replacement parts may be ordered from the factory. All warranty parts will be shipped freight allowed from the factory via standard ground service. Warranty parts must be returned within 30 days. Credit will be issued if part is complete, defective and returned on time.

Dealer/Contractor Name:_____ Address:_____

City:_____ State:_____Zip:_____Ph:_____

When parts are ordered, MODEL NUMBER, SERIAL NUMBER, FACTORY ORDER (F.O.) AND PART NUMBERS are required. Belts, filters and fuses are not covered under warranty.

Applied Air

4830 Transport Drive, Dallas, TX 75247
Phone: 214-638-6010 Fax: 214-905-0806
www.appliedair.com